[H.N.S.C. No. 104–5]

RINGS

ON

NATIONAL DEFENSE AUTHORIZATION ACT FOR FISCAL YEAR 1996—H.R. 1530

AND

OVERSIGHT OF PREVIOUSLY AUTHORIZED PROGRAMS

BEFORE THE

COMMITTEE ON NATIONAL SECURITY HOUSE OF REPRESENTATIVES

ONE HUNDRED FOURTH CONGRESS

FIRST SESSION

MILITARY RESEARCH AND DEVELOPMENT SUBCOMMITTEE HEARINGS

ON

TITLE II—RESEARCH, DEVELOPMENT, TEST, AND EVALUATION

HEARINGS HELD

MARCH 28 AND AUGUST 3, 1995

U.S. GOVERNMENT PRINTING OFFICE

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104TH CONGRESS
1ST SESSION

H. R. 1530

To authorize appropriations for fiscal year 1996 for military activities of the Department of Defense, to prescribe military personnel strengths for fiscal year 1996, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

MAY 2, 1995

MR. SPENCE (for himself and Mr. DELLUMS) (both by request) introduced the following bill; which was referred to the Committee on National Security

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A BILL

To authorize appropriations for fiscal year 1996 for military activities of the Department of Defense, to prescribe military personnel strengths for fiscal year 1996, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the "National Defense Authorization Act for Fiscal Year 1996".

* * * * * * *

TITLE II—RESEARCH, DEVELOPMENT, TEST, AND EVALUATION

SEC. 201. AUTHORIZATION OF APPROPRIATIONS.

(a) FISCAL YEAR 1996.—Funds are hereby authorized to be appropriated for fiscal year 1996 for the use of the Armed Forces for research, development, test, and evaluation, as follows:

(1) For the Army, $4,444,175,000.
(2) For the Navy, $8,204,530,000.
(3) For the Air Force, $12,598,439,000.
(4) For Defense-wide activities, $9,084,809,000, of which—
    (A) $259,341,000 is authorized for the activities of the Director, Test and Evaluation; and
    (B) $22,587,000 is authorized for the Director of Operational Test and Evaluation.

(b) FISCAL YEAR 1997.—Funds are hereby authorized to be appropriated for fiscal year 1997 for the use of the Armed Forces for research, development, test, and evaluation, as follows:

(1) For the Army, $4,240,968,000.

(2) For the Navy, $7,716,920,000.

(3) For the Air Force, $11,655,554,000.

(4) For Defense-wide activities, $9,040,169,000, of which—

(A) $267,029,000 is authorized for the activities of the Director, Test and Evaluation; and

(B) $22,978,000 is authorized for the Director of Operational Test and Evaluation.

* * * * * * *

BUDGET REQUEST

HOUSE OF REPRESENTATIVES,
COMMITTEE ON NATIONAL SECURITY,
MILITARY RESEARCH AND DEVELOPMENT SUBCOMMITTEE,
Washington, DC, Tuesday, March 28, 1995.

The subcommittee met, pursuant to call, at 10 a.m., in room 2118, Rayburn House Office Building, Hon. Curt Weldon (chairman of the subcommittee) presiding.

OPENING STATEMENT OF HON. CURT WELDON, A REPRESENTATIVE FROM PENNSYLVANIA, CHAIRMAN, MILITARY RESEARCH AND DEVELOPMENT SUBCOMMITTEE

Mr. WELDON. The hearing will come to order.

We are honored today to have with us Dr. Paul Kaminski, Under Secretary of Defense for Acquisition and Technology, to provide testimony on the fiscal year 1996 Research and Development budget request.

After Dr. Kaminski's opening remarks he will be joined at the witness table by Dr. Anita Jones, Director of Defense Research and Engineering and Dr. George Schneiter, Director of Strategic and Space Systems.

Dr. Kaminski, the Nation is very fortunate to have you at the helm in charge of acquisition and technology at the Department of Defense. Whatever concerns I have about the course the department is on and questions I have about specific programs, I believe that there are very few individuals in this country who could bring to the job your qualifications, capacity, and dedication.

The Department's research, development, test, and evaluation request for fiscal year 1996 is $34.3 billion. This is 500 million less than what the Department projected last year for the 1996 request. It is also down 28 percent from its high in 1987.

And, of course, just looking at the numbers doesn't reflect the fact that the composition of the R&D account is different today than it was in 1987. Further highlighting the broken state of the acquisition process is the fact that there are many programs still in R&D that were in R&D in 1987. I have many concerns about the course that has been set. To mention a few:

Ballistic missile defense is underfunded. But that is an issue that we are addressing with a specific set of hearings, jointly through this subcommittee and the Military Procurement Subcommittee.

The research and development, test and evaluation infrastructure remains far larger than is necessary to support the research and testing effort. Reductions promised and hoped for through the BRAC process have been minimal.

This unnecessarily large infrastructure drains valuable dollars away from programs throughout the defense budget that should be funded.

Military services too frequently are allowed by the joint review process and civilian hierarchy in the Office of the Secretary of Defense to pursue service-specific programs. This has been true for everything from relatively simple programs like the 2.75-inch air-to-surface rocket to tactical aircraft. This has enormous consequences for life cycle costs.

Too many programs exist for the dollars that are available to adequately fund those programs. Over 30 precision guided munitions programs exist in the Department. We have gotten so accustomed to service-unique programs that it was considered a major news story when Vice Admiral Owens, Vice Chairman of the Joint Chiefs, and the Chairman of the Joint Requirements Oversight Council, announced last week that all future munitions programs will be inter-operable between at least two services.

The R&D program lacks balance. While dual use program funding has increased 75 percent over the past 3 years in the Advanced Research Projects Agency, other programs are denied the funding required to be effectively executed.

As an example, we are told that a shortfall of $200 million in the Department's request for the F–22 this year will result in a no value-added cost impact to the program of $1 billion. Dual use programs are fine, but should they be funded to the detriment of the proper execution of programs the Department claims are essential to national security?

Promises of future increases in the acquisition account are based on projected savings from BRAC and acquisition reform. Yet, to-date, the BRAC process has failed to yield the projected savings and it remains to be seen whether or not the hoped for savings potential for acquisition reform will yield the savings anticipated. And in addition, we continue to pay for programs out of the Defense budget that have very little if anything to do with national security.

Over classification of programs and compartmentalization of authority and information, particularly in the intelligence and space programs, results in duplication of effort and additional costs to the Nation.

With the Department's emphasis on dual use, it still relies to a very significant extent on its federally funded research and development centers and bloated laboratory structure for studies and analysis, systems integration, and research efforts.

Finally, I see little focus or visibility of life cycle cost reduction initiatives on the R&D side of the house. For the most part, the Department is still focusing on the procurement system itself, and on decisions which are made after a system is far along in development.

My concern is not that there aren't any R&D affordability initiatives underway, but that there appears to be a lot of compartmentalization of service efforts and little evidence of information sharing to maximize the returns of individual service's R&D.

At best, this limits the ability of all services to benefit from the work that has been done and at worst, it causes costly duplication. I am also concerned that the fragmented nature of these efforts has limited our ability to channel the results of individual service R&D efforts into major systems for comprehensive savings. If we are going to spend money on affordability initiatives, we should ensure that we are getting the maximum return on our dollar.

So, Dr. Kaminski, my concerns are many. But as I stated earlier, I have great respect for your ability and know you are putting your best effort into the task. For that, we are appreciative. Congress doesn't always do everything correctly either.

But I am willing to work with you on any of these or other matters where you believe we can achieve the performance and efficiency goals that we both share.

I thank you for taking your time to be with us and look forward to your statement. We will enter your prepared statement in the record. Before you begin your opening statement, let me yield. Mr. Spratt has not arrived yet. I would ask if Mr. Taylor would have any comments.

Mr. Spratt has arrived. I will allow Mr. Spratt to achieve his place on the podium and we would ask him to make an opening statement for the minority.

[The prepared statement of Mr. Weldon follows:]

STATEMENT OF CHAIRMAN CURT WELDON
FISCAL YEAR 1996 RESEARCH AND DEVELOPMENT REQUEST
MARCH 28, 1995

The hearing is called to order.

We are honored today to have with us Dr. Paul Kaminski, Undersecretary of Defense for Acquisition and Technology, to provide testimony on the fiscal year 1996 Research and Development budget request. After Dr. Kaminski's opening remarks he will be joined at the witness table by Dr. Anita Jones, Director of Defense Research and Engineering and Dr. George Schneiter, Director of Strategic and Space Systems.

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The department's Research, Development, Test, and Evaluation request for fiscal year 1996 is $34.3 billion. This is $500 million less than what the department projected last year for the '96 request. It is also down 28 percent from its high in 1987. And, of course, just looking at the numbers doesn't reflect the fact that the composition of the R and D

account is different today than it was in 1987. Further highlighting the broken state of the acquisition process is the fact that there are many programs still in R&D that were in R&D in 1987.

I have many concerns about the course that has been set. To mention a few:

- Ballistic Missile Defense is underfunded. But that is an issue that we are addressing with a specific set of hearings.
- The Research and Development, Test, and Evaluation infrastructure remains far larger than is necessary to support the research and testing effort. Reductions promised and hoped for through the BRAC process have been minimal. This unnecessarily large infrastructure drains valuable dollars away from programs throughout the defense budget that should be funded.
- Military services too frequently are allowed by the joint review process and civilian hierarchy in the Office of the Secretary of Defense to pursue service-specific programs. This has been true for everything from relatively simple programs like 2.75" air-to-surface rockets to tactical aircraft. This has enormous consequences for life cycle costs.
- Too many programs exist for the dollars that are available to adequately fund those programs. Over 30 precision guided munitions programs exist in the department. We have gotten so accustomed to

service-unique programs that it was considered a major news story when Vice Admiral Owens, Vice Chairman of the Joint Chiefs and the Chairman of the Joint Requirements Oversight Council, announced last week that all future munitions programs will be interoperable between at least two services.

• The R&D program lacks balance. While dual use program funding has increased 75 percent over the past three years in the Advanced Research Projects Agency, other programs are denied the funding required to be effectively executed. As an example, we are told that a shortfall of $200 million in the department's request for the F-22 this year will result in a no value-added cost impact to the program of $1 billion. Dual use programs are fine, but should they be funded to the detriment of the proper execution of programs the department claims are essential to national security?

• Promises of future increases in the acquisition account are based on projected savings from BRAC and acquisition reform. Yet, to date, the BRAC process has failed to yield the projected savings and it remains to be seen whether or not the hoped for savings potential for acquisition reform will yield the savings anticipated. And in addition we continue to pay for programs out of the defense budget that have very little if anything to do with national security.

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- With the department's emphasis on dual use, it still relies to a very significant extent on its federally funded research and development centers and bloated laboratory structure for studies and analysis; systems integration; and research effort.

- Finally, I see little focus or visibility of life cycle cost reduction initiatives on the R&D side of the house. For the most part, the department is still focusing on the procurement system itself, and on decisions which are made after a system is far along in development. My concern is not that there aren't any R&D affordability initiatives underway, but that there appears to be a lot of compartmentalization of service efforts and little evidence of information-sharing to maximize the returns of individual service's R&D. At best, this limits the ability of all services to benefit from the work that has been done and at worst, it causes costly duplication. I am also concerned that the fragmented nature of these efforts has limited our ability to channel the results of individual service R&D efforts into major systems for comprehensive savings. If we are going to spend money on affordability initiatives, we should ensure that we are getting the maximum return on our dollar.

So, Dr Kaminski, my concerns are many. But as I stated earlier, I

have great respect for your ability and know you are putting your best effort into the task. Congress doesn't always do everything correctly either. But I am willing to work with you on any of these or other matters where you believe we can achieve the performance and efficiency goals that we both share.

I thank you for taking your time to be with us and look forward to your statement. We will enter your prepared statement in the record. Before you begin your opening statement, let me yield to the ranking member of the subcommittee, the gentleman from South Carolina, Mr. Spratt, for an opening statement.

Mr. SPRATT. Dr. Kaminski, welcome.

I look forward to your testimony. That concludes my presentation.

Mr. WELDON. It is all yours, Dr. Kaminski.

Dr. KAMINSKI. Thank you, Mr. Chairman.

STATEMENT OF PAUL G. KAMINSKI, UNDER SECRETARY OF DEFENSE FOR ACQUISITION AND TECHNOLOGY

Dr. KAMINSKI. Thank you, Mr. Chairman.

With your permission, I would like to have my full statement entered into the record. I would comment in opening that I think many of the items that you enumerated in your opening statement, indeed, are on my agenda. I look forward to the opportunity to cooperate with you to make some progress on these issues.

Mr. Chairman, my principal responsibility as the Under Secretary for Acquisition and Technology is to work closely with our Joint Requirements Oversight Council to ensure that the Department fields technologically superior weapons systems at an affordable cost.

The Department's fiscal year 1996 research and development program was built to satisfy this objective, while addressing three dramatic changes in today's national security environment. The first change is the post-cold-war needs transition or why we are buying our weapons systems.

Today, the mean value of the single greatest threat facing the United States is down considerably. Ironically, the diversity and the variance of the collective threat that we need to deal with is not down. It is in fact up.

The second transition that we are dealing with is a change in the way that America fights and it affects what weapons systems we buy. This change is captured in the notion of the so-called revolution in military affairs.

It is driven by the desire to make use of a wide range of new technologies, to improve battlefield situation awareness, and shorten the time it takes U.S. commanders to bring effective force to bear on their objectives.

The goal is for U.S. forces to achieve two things: one, a dominant battlefield awareness; knowing what is going on in the battlefield around them; and second, what I describe as dominant action cycle time. That is being able to close the loop to do something about the situation to improve our reaction time on the battlefield.

The third transition is the change in the way America develops and fields its weapons systems. Today, I will describe a vision of what I would call a revolution in military acquisition affairs or RMA squared.

This revolution is changing how we go about buying our weapons systems. In particular, we are making progress on three fronts. First, increasing our focus on life cycle cost reduction, as you mentioned in your opening remarks. It is very high on my list.

Second, making better use of our national industrial base. I underline the word here "national" not simply a defense unique industrial base.

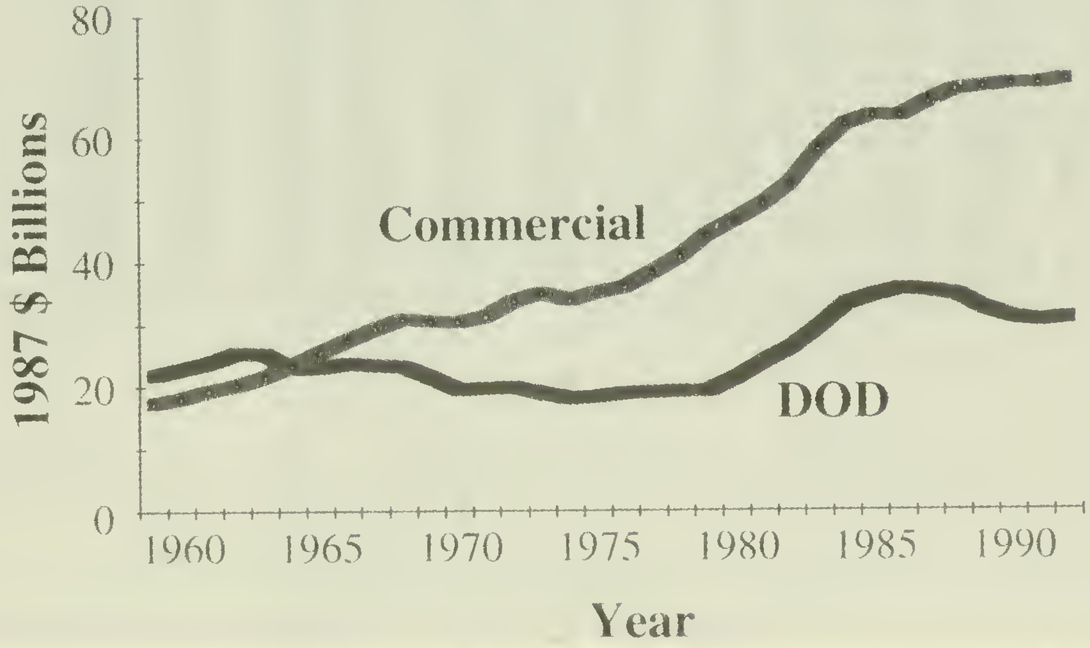
Third, actually implementing our acquisition process improvement activities. Of the first component in this revolution that I de-

scribed is our increased focus on life cycle cost reduction. We are indeed shifting away from a world where performance is the only consideration and toward a more balanced view looking at the cost of performance.

Cost in fact has a seat at the table as we are describing and making decisions on our major new programs. The Department is also placing greater reliance on commercial sources to make our DOD weapons systems more affordable.

Over the past 30 years, the evolutionary change in the industrial base that supports DOD is not less dramatic than the changes in the world order since the end of the cold war. While DOD purchases have declined, America's commercial markets have continued to expand.

DOD and Commercial R&D Expenditures



As this chart shows, in aggregate terms, commercial industry surpassed the DOD in research and development spending in 1965. As shown on this chart, the disparity between DOD and commercial sector investment in R&D has been growing wider ever since.

The difference means that this Nation's technological momentum is being driven to a greater extent by commercial market forces than by the DOD market forces. In this environment, we have no choice but to move from separate industrial sectors for defense and commercial products to an integrated national industrial base leveraging the combination.

Leveraging commercial technological advances to create military advantage is absolutely critical to ensuring that our equipment remains affordable and the most advanced in the world. Here is where the Department's dual use strategy and the technology reinvestment program, the so-called TRP, play a big role.

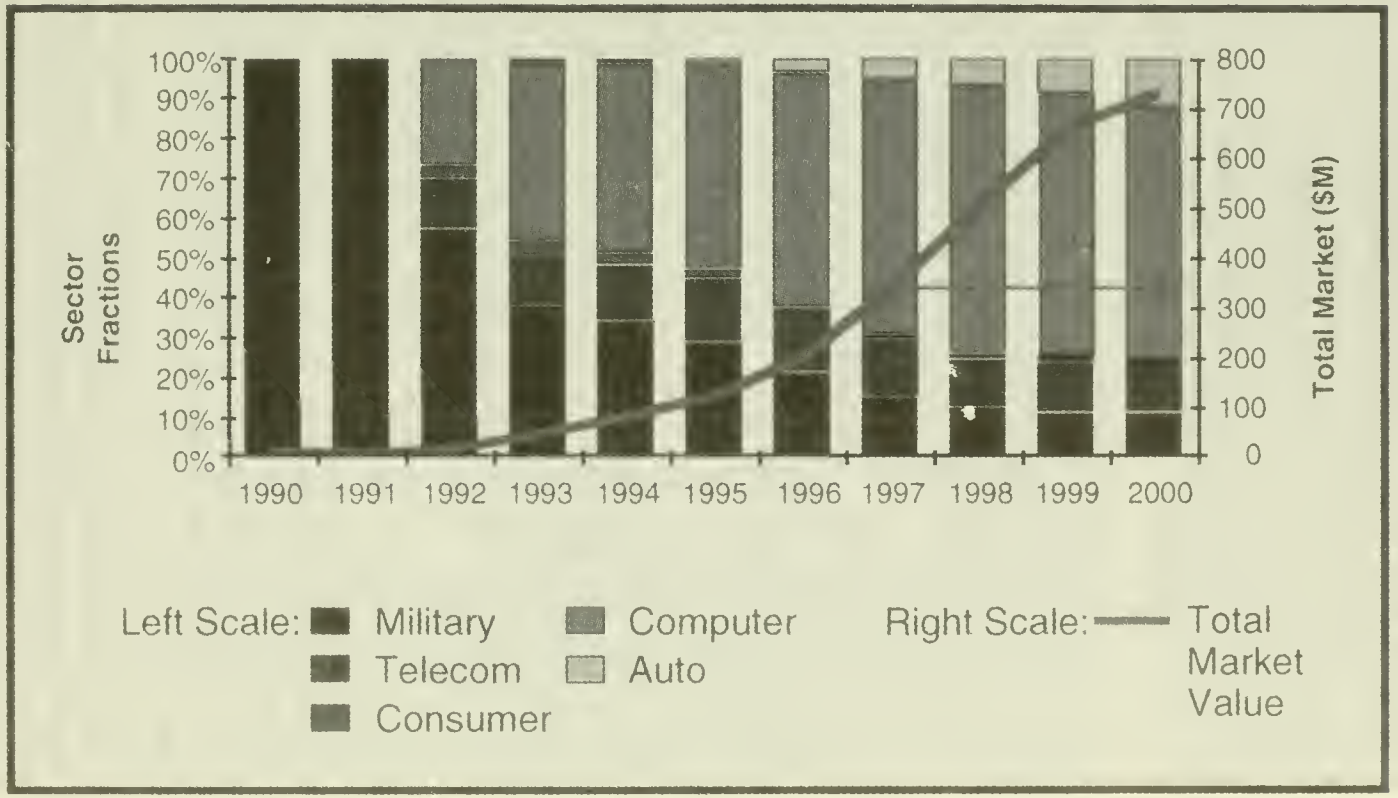
A good example of this program is the Department's investment in a technology associated with electronic packaging. It is called multichip modules or MCM's. Let me first, if I may, illustrate what we mean by this esoteric technology. The idea is to be able to package—in a single substraight module.

Mr. Chairman, what we have here is the following equivalent. This board right here filled with semiconductor devices, memory, and processors, through this packaging technology has been collapsed into this piece.

The size of this piece, in fact, is exaggerated because the active pieces is a square in the center about an inch-and-a-half square. These are wires coming out here for attachment purposes.

As you might guess, this MCM package technology has tremendous leverage in our DOD systems where we are trying to pack a lot of performance into small spaces. The DOD took the lead in beginning to develop and exploit this technology.

Multi-Chip Module Market Trends



If I could draw your attention to the curve. On the left-hand side of the curve, what we see is the fraction of the market occupied by DOD. In 1990 and in 1991, the fraction was 100 percent. The DOD was the only exploiter of this technology because it was very expensive. It was very high leverage for our advanced systems. As time goes on, I would draw your attention to the yellow curve. That is our projection of the overall growth in the market.

When the DOD was first exploiting this technology, the total market numbers were very small. In fact, even in 1995, the total market is roughly $100 million per year. Our forecast for the year 2000 is that this market will grow to a $700 million per year market.

You can see what happens over that period of time. DOD's percentage of that market goes from 100 percent in 1990 to about 10 percent in the year 2000. As it does that, not only does the performance of what we can put into a small unit go up, but the cost goes down dramatically as we are buying this technology off of commercial lines.

As a result, the Department is able to buy off commercial multichip module lines and capture savings in the prices that we pay. So, our plan here is to be involved at the beginning of these technologies to leverage our investments, to combine them with commercial investment for a selfish purpose; to buy off this line later at lower cost to the DOD.

I have no interest, Mr. Chairman, in these dual use programs or investing in these programs unless the net round trip to the DOD results in lower costs for our applications. Greater performance and lower cost is the objective.

I have been in my job now for about 5 months. I can say that the TRP program was not really invented by me or on my watch.

I must say that if this program did not exist today, that the TRP would be precisely the type of program that I would be trying to establish to support this underlying technology of leveraging the commercial marketplace for DOD use.

The real center of gravity in our revolution and military acquisition affairs is an improvement in our acquisition process. Progress along this front makes us more efficient, enables the DOD to purchase off commercial lines. In the end, it allows us to buy more with less.

One such initiative in this arena is the Department's new mechanism called advanced concept technology demonstrations. This esoteric term means rapidly transferring technology that often is developed today into the hands of users for evaluation and for shortening our cycle times.

These ACTD's are integrating efforts to assemble and demonstrate a significant new military capability at a scale size adequate to establish operational utility and system integrity.

Our plan for ACTD's is to allow our war fighter user to evaluate the military utility of the technology before we commit to a major acquisition effort, to develop concepts of operation for employment of the new technology, and to retain a low cost residual operational capability in the field.

Let me give you examples of two such initiatives. One is our Tier II Plus program; a new family of unmanned air vehicles to be able

to provide enduring reconnaissance capability; quite an unusual program for the Department. The program had only one requirement. That the unit fly-away cost be $10 million. The objective was to pack as much military reconnaissance capability as we could into that platform at a constrained unit price.

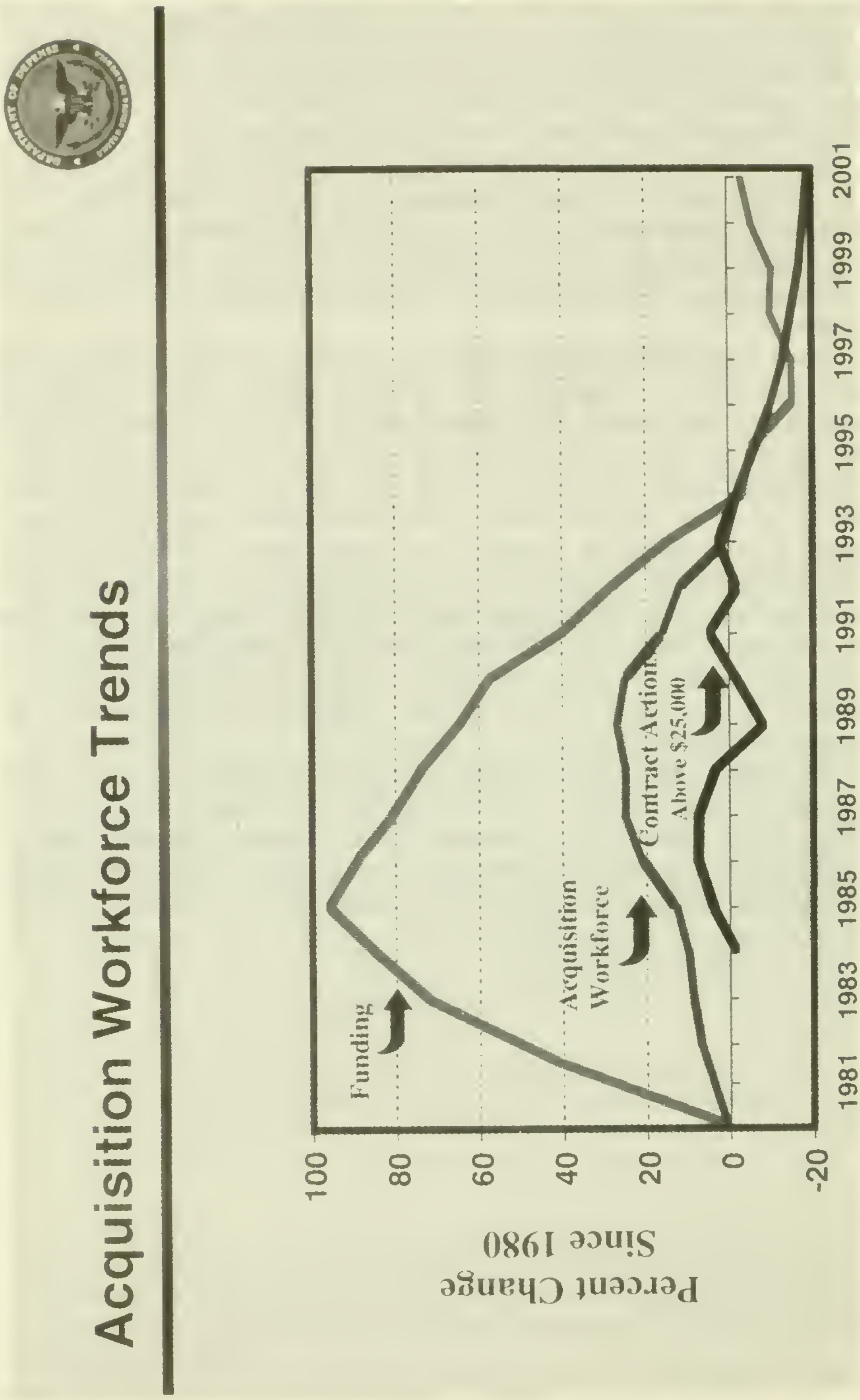
That program is currently under development on a very interesting and promising track. Another example of an ACTD is a program we are about to start; something called total asset visibility.

One of the problems that we face in the Department is that when we ship equipment to a contingency, it is very hard if someone isn't there to receive the equipment to later find what has been shipped and where is it.

We have people spending hours opening up shipping containers to find out what is inside. We have trouble on the other end in terms of knowing what equipment ought to be where. Commercial technology has already been developed to answer most of the needs that we have here. A whole family is at work; advanced data base technology and advanced tags to be able to find equipment.

We are undertaking a program in total asset visibility and applying this technology to our problem. There is no reason why a local commander looking for a particular kind of clothing can't dial into his interrogator and ask the container that has that particular article to beep so we can move right to that container, open up that equipment, withdraw it, and know where it is when we move on to the next contingency.

The idea here in many cases is to take technology that has been developed, commercially, off the shelf and apply it to our needs. Underlying our activity in acquisition reform requires that we pay some attention to the infrastructure that the Chairman mentioned in his opening remarks as well. If I might have the next chart.


Acquisition Workforce Trends
Percent Change Since 1980
100
80
60
40
20
0
-20
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
Funding
Acquisition Workforce
Contract Actions Above $25,000

I have had a careful look here at what has been happening to our acquisition work force through the years. This chart plots three separate items.

The first one in blue is our investment funding. I have normalized these each starting at 1980. What is indicated in the plot is percentage change.

What is shown here, Mr. Chairman, is that from 1980 until the peak in about 1986 or 1987, our investment funding went up about 90 percent. That funding now in 1996, you can see, is a little bit below the zero percent line. It is reduced slightly over what it was in the 1980 baseline.

In green, I am showing the size of the acquisition work force in the Department. What you can see on this chart is that it in fact did grow along with the increase in funding, but it has about a 2- to 3-year lag. That is, it didn't peak until about 2 to 3 years after the investment funding peaked.

Now, that acquisition work force is going down. By our projections, it will go down from a peak that was up about 25 percent over the 1980 base to a value that will be about 20 percent below that number; a net reduction of about 45 percent in the total size of that work force. That is part of the infrastructure reduction that we are looking for.

Just for interest, I have also plotted in black the number of contract actions that we have undertaken over $25,000 in value. What that curve shows is that there really isn't a good relationship between the number of contract actions and the number of dollars spent.

As a result, you cannot expect a work force to track one for one because the workload doesn't track one for one with the total amount of funding. Stated another way, it doesn't take half the number of people to supervise a $400 million as it does to supervise an $800 million contract.

Overall, the important issue is to be reducing that infrastructure. You can see that the trends are correct. You can also see that there is a 2- to 3-year lag that we are dealing with.

We have come a long way in the Department in terms of implementing our acquisition reform. We have quite a bit to go, Mr. Chairman. The overall objective for us is to make our system truly responsive. To do so, we must collectively unlearn some of the experience that we have learned over the past 10 years. My goal in this process of acquisition reform is to create a climate of reasoned, well informed, prudent risk taking.

A good case in point that I have used for illustration is the Army's M1A2 Abrams tank upgrade program. I will describe this program to you later, but as a result of restructuring the program and applying acquisition reform, we project savings of about $170 million over the next 5 years through a combination of reducing the cost of our depleted uranium armor, reducing the cost of the canon, and setting the program on a multiyear procurement schedule.

Mr. Chairman, to just indicate some of the things that have been implemented by each of our services in the Acquisition Reform Program.

The first is just a fundamental change in requirements and in cycle time, with respect to things being done in the Army. The old

first generation Forward Looking Infrared Radar [FLIR] was on a 15-year development cycle.

The second generation FLIR, being developed with a foundation through the battle labs, is on a 5-year development cycle. There is still room for improvement; but a big improvement over where we were.

If we look at our procurements that are going out, if I picked the past one some years back on ATACMS, we had a statement of work that was 503 pages long and 112 military specifications that had to be satisfied to proceed with this system.

In the ATACMS Block 2, the statement of work is 11 pages long. There is an 8-page performance specification. That is, what it is we want, not how to go about building it. No military specifications are being used in the system. It is commercially based.

I would draw your attention, in the interest of time here, to the bottom line; a concept called direct vendor delivery. I personally reviewed a program that was in place here at Parris Island last week in which, rather than buying food and warehousing it for the mess hall at Parris Island, what we set up is a program in which, with a 48-hour advance, the mess hall can place an order for food required in the next 48 hours.

That food is shipped directly to the mess hall with no intermediate warehousing, directly from the supplier to the end customer, saving a few million per year in warehousing costs and in shipping on the facility, and in providing noticeably better food for our Marine recruits.

These are some of the acquisition reform efforts underway in the Navy. The first is a message processing system. If we look at the classical approach taken in the past on the V–5 system, our development time was 10 years. The price was $25 million. The order time to delivery was about 3 years. Each of those have been improved: Development time reduced by a factor of 5; price by a factor of 2, and order time by a factor of about 10.

Similar improvements are associated with our procurement, design, and build programs. I would draw your attention perhaps just to one more item: the JSTARS Program where we have also streamlined our test activities, resulting in about a $2.5 million net savings.

Finally, some of the programs underway in the Air Force. Looking at requirements again, the pre-pilot program for Joint Direct Attack Munition [JDAM] ended up with a 3-year cycle time from milestone zero to contract. If I compare that with the following related effort, the Wind Corrected Munitions Program, that is a 1-year process.

If I look at the procurement associated with the program, the request for proposal on the baseline was 986 pages. The Wind Corrected Munitions Program reduced that by a factor of 10—a dramatic reduction in the data and in the program office size from 81 people to 20.

Mr. Chairman, if I might make a few comments on our overall plans for modernization and recapitalization. Our current level of investment in the department includes $39.4 billion in procurement and $34.3 billion in RDT&E in our fiscal year 1996.

This level of investment is not sufficient to sustain the forces in our Bottom-Up Review force over the long-term. We know that. We recognize that in our planning for the program. During the period for the current future years' defense plan, 1996 to 2001, the department's investment focus must transition to a broader program of modernization and recapitalization. We in fact plan to do just that.

As a result, budget authority for procurement in fiscal year 2001 is projected to be 47 percent higher than in fiscal year 1996. The objective of this effort is to systematically upgrade and replace portions of the department's capital stock.

It is important to stress that the department does not need to implement a one-for-one platform replacement strategy across our entire inventory. Our Advanced Concept Technology Demonstration Program that I described is one of the keys to examining a broad range of alternatives to a single platform by platform replacement. It will be a key element in our strategy.

Also, today during this period of a procurement pause, we must create what I would describe as technology on-ramps for our future systems as the procurement funding is increased. Today's R&D investment in suitable technology on-ramps provides us the basis for initiating and sustaining a procurement program tomorrow.

Our technology on-ramps are a collection of individual technology programs in research and development category 6.1, 6.2, the basic research and exploratory development; and 6.3, 6.4, advanced development and engineering and manufacturing development. These efforts are typically linked in a technology insertion road map to a specific weapons system acquisition program; either a new start or an upgrade to satisfy the war fighters' stated mission needs.

The leading edge systems in the U.S. inventory today were made possible through decades of investment in fundamental science and exploratory development work. The technology ramps initiated in the early 1960's and sustained in the 1970's gave us the Stealth aircraft, precision-guided munitions, and night vision systems that provided the U.S. forces with a decisive combat edge during the 1991 gulf war.

Let me talk a little bit about some personal experience as director of the F–117 Program during a previous career that I had as an Air Force officer in the Department of Defense. In some cases, it is difficult to see the end application of some of our technology, which can be more than 20 years away.

The F–117 system provides a good illustrative example of the need for a stable and long-term R&D investment in the key enabling defense technologies. This system, the F–117, became operational in 1983. It was at that time a compartmented program.

However, the key enabling technologies for this system can be traced back to mathematical formulations of radar scattering geometries and the development of radar absorbing materials that dated back to the early 1960's.

Stealth Fighter Technologies in Hand

- Turbine Engines
- Digital Fly-by-Wire Flight Controls
- Radar Cross Section (RCS) Mathematical Tools
- RCS Test Ranges
- Computation Fluid Dynamics (CFD) Codes
- Wind Tunnels for Inlets and Airframe
- Forward Looking Infra Red (FLIR)
- Target Tracker
- Laser Designator

During the 1970's, the Department's investment in 6.2 exploratory development produced new titanium alloys, better compressor seals, stealth nozzle designs, and many other technologies needed for the Defense Research Projects Agency to build two Have Blue prototypes.

These were proof of concept flight demonstration vehicles for what would later become the operational F–117.

That was the approach we had to take in the early technology demonstration. The next step was to take it from this concept to an operational useful weaponized platform.

We were able to go from the prototype that I just demonstrated to an operational system in just 6 years; a true record for this kind of closure. The reason we were able to do this was because most of the other technologies were already in hand.

The F–117 benefited greatly from the R&D investments that were made for a broader set of purposes. It includes this whole family. For example, the engines and the digital fly-by wire controls which were critical to this aircraft were already in hand, developed in our technology base programs.

The mathematical tools and the test ranges needed to design a low radar cross section flight vehicle were developed under the ABREVS Program in the 1960's for the design of ballistic missile reentry vehicles; a purpose which then was totally unrelated to stealth aircraft.

Our early investments in so-called computational fluid dynamics codes and wind tunnel test infrastructure meant that we had these tools available for the F–117 as well. The story is the same for the forward looking infrared system, the target tracker, and the laser designator systems.

None of these was developed specifically for the F–117. They were fine tuned to the application, but the technology was in place. My point is that robust R&D investments today lead to affordable technologically superior weapons systems tomorrow.

In summary, Mr. Chairman, every weapons system in the U.S. inventory today required decades of direct investment in critical enabling technologies, the creation of suitable technology ramps, and the sustainment of a coherent and continuing modernization program.

The Department is committed to maintaining the legacy of technological supremacy at an affordable cost. Our 1996 budget submission contains, in my opinion, a prudent and relevant mix of the defense research, development, test, and evaluation requirements.

This program is needed to produce tomorrow's weapons systems. It initiates the Department's long-term modernization strategy, and it meets the needs of the Nation.

It will also preserve a legacy of technological superiority for U.S. forces in the 21st century. I thank you for this opportunity to appear before the committee. I will be happy to answer any questions you may have at this point or, Mr. Chairman, to go right on to the briefing that was requested.

[The prepared statement of Dr. Kaminski follows:]

Statement of

The Under Secretary of Defense for Acquisition and Technology
Paul G. Kaminski

Before the
Research and Development Subcommittee
of the House Committee on National Security

on

The FY 1996 DOD RDT&E Program

March 28, 1995

Embargoed Until Released by the
House Committee on National Security

Mr. Chairman, Members of the Subcommittee, and staff, thank you for the opportunity to appear before you today to discuss the specifics of the Department of Defense Research, Development, Test & Evaluation (RDT&E) programs and how they support the Department's overall modernization plans and the war fighter's needs.

Mr. Chairman, you may have heard of the Department's studies of a "Revolution in Military Affairs" or RMA. The revolution derives not from a single innovation or idea but from a fundamental change in the way America fights. The revolution is driven by making full use of a wide range of new technology involving sensors, computers, low observables, precision guided munitions and telecommunications.

Today, I describe a vision of a second but related revolution -- a "Revolution in Military Acquisition Affairs" -- or RMA^2. This revolution will change the way America develops and fields weapon systems. Like the first revolution, this second revolution is driven by capturing the synergism derived from the integration of multiple thrusts. In particular, we are making progress on three fronts: increasing our focus on life cycle cost reduction; making better use of the national industrial base; and implementing acquisition process improvements.

REDUCING LIFE CYCLE COST

The first component of this revolution is the Department's increased focus on life cycle cost reduction. The Department is shifting away from a world where performance is the only consideration and towards a more balanced "cost of performance" view. I am pleased to report that weapon system life cycle cost is being treated as an <u>independent</u> variable, not simply as a fall-out <u>dependent</u> variable.

As the Department's senior acquisition executive, I chair the Defense Acquisition Board (DAB) along with Admiral Owens who, as Vice Chairman of the Joint Chiefs of Staff, wears another hat as chairman of the Joint Requirements Oversight Council (JROC). Together, we have created a strong imperative throughout the Department to do the up front trades; assess the incremental cost of driving requirements; and find the knee of the cost-performance curve(s). Our objective is to insure that the Department's modernization and recapitalization plan continues to be built on a solid foundation of timely and explicit affordability decisions.

Our attention is not focused solely on the initial acquisition cost. We are concerned with overall life cycle cost. This emphasis is driven by the fact that 60-70% of most weapon system's costs are incurred subsequent to initial deployment of the system. To the extent the Department maintains systems longer, life cycle cost becomes a more important consideration. The message here is that "back end" sustainment costs are receiving more "up front" design attention. Where it makes sense, the Department will invest in reliability upgrades to reduce the ownership costs for existing systems. For new or existing systems, the payoff associated with these life cycle cost initiatives -- in terms of savings to the Department's budget bottom line -- will not be realized over the near term, but over the long term.

The Department's Science and Technology (S&T) program, funded through budget categories 6.1/6.2/6.3, supports life cycle cost reduction for new and existing systems through investments in a number of supporting technologies. Some of the Department's more prominent technology thrusts for affordability include: improved modeling and simulation; advanced manufacturing processes; and embedded corrosion and fracture sensors. These technology investments are essential to maintain effective and capable platforms over increasingly longer service lives. The Department's projected force structure and budget requirements are related to service life assumptions supported by this S&T base.

LEVERAGING THE NATIONAL INDUSTRIAL BASE

The second component of our revolution is leveraging the commercial industrial base. Over the past 30 years, the evolutionary change in the industrial base that supports DOD is no less dramatic than the changes in the world order since the end of

the cold war. While DOD purchases have declined, America's commercial markets have continued to expand. The rapid growth of the commercial industrial sector, driven by a commercial market flourishing quite independently of DOD, has reduced the once central role of defense spending as a driving force for innovation.

In aggregate terms, commercial industry surpassed the DOD in R&D spending back in 1965. The disparity between the DOD and commercial sector investment in R&D has been growing wider ever since. This difference means that relatively more of this nation's technological momentum will be based on what's coming out of essentially commercial enterprises.

The bottom line is that we have no choice but to move from separate industrial sectors for defense and commercial markets to an integrated national industrial base. Leveraging commercial technological advances to create military advantage is critical to ensuring that our equipment remains the most advanced in the world. The objective is to marry the momentum of a vigorous, productive, and competitive commercial industrial infrastructure with the unique technologies and systems integration capabilities provided by our defense contractors.

The Department's dual use investment strategy is documented in a February 1995 DOD report entitled *Dual Use Technology: A Defense Strategy for Affordable, Leading-Edge Technology*. This strategy builds on the Department's efforts to improve the defense acquisition process. Improved procurement business practices are the foundation for our efforts to establish an integrated defense-commercial industrial base. The Department's dual use strategy contains three main pillars:

- Invest in dual use technologies critical to military applications;
- Integrate military and commercial production;
- Insert commercial components into military systems.

The first pillar involves leveraging the commercial sector's technology base investment. Commercial industry is now the technological agent of change in information systems, telecommunications and micro-electronics. The Department's dual use technology program is tailored to leverage off the commercial technology base so that the taxpayer does not have to pay for the entire technology investment.

The second pillar is the "dual produce" concept. The Department is putting a great deal of emphasis on taking advantage of commercial production to manufacture defense equipment. Producing major weapon system platforms on a commercial line will be more the exception than the rule. However, there is great potential for doing this at the subsystem and critical component level of assembly.

The third piece of the strategy calls for DOD to make those investments that are needed to facilitate use of commercial components in defense systems. The objective is to have components "designed for dual use." This pillar recognizes that acquisition reform and dual use technology investments are not, by themselves, sufficient to ensure use of commercial components. Program managers and contractors still face up-front costs and risks in adopting commercial products and technologies -- for example, the cost of determining that a commercial integrated circuit will withstand the necessary extremes of temperature and humidity, or the cost of engineering a commercial component to fit an existing military system. Where it makes sense, DOD must offset those costs and risks at a level of organization that shares rather than duplicates common costs.

Through initiatives like the Technology Reinvestment Project (TRP), the Department is placing greater reliance on commercial sources to make DOD's weapon systems more affordable. A good example is the Department's investment in an electronic packaging technique -- it is called Multi-Chip Modules or MCMs. DOD was the early leader in advancing this technology. In 1990 and 1991, there was virtually no commercial market. The Department's current projections are that the market demand for MCMs will grow to several hundred millions of dollars by the turn of the century. This growth is driven by the demand of the commercial telecommunications and computer industry. Today, over half of MCM sales are for commercial applications. And by the turn of the century, the DOD percentage of that market will drop to about ten percent of the total. As a result, the Department is able to buy off commercial MCM lines and capture savings in the prices DOD pays. I have no reason to invest in development of a commercial capability if the DOD is not planning to buy off that commercial line to generate a net savings for the Department of Defense.

Mr. Chairman, I have been in my job now about five months. So, the TRP was not really invented on my watch. But I must say, that if it did not exist today, the TRP

would be precisely the type of program I would be trying to establish to support this underlying strategy.

I am absolutely convinced that the benefits of a better leveraged industrial base are not only reduced cost, but shortened acquisition cycle times as well. The Department of Defense can not afford a 15-year acquisition cycle time when the comparable commercial turnover is every 3-4 years. The issue is not only cost. The lives of our soldiers, sailors, marines and airmen may depend upon shortened acquisition cycle times as well. In a global market, everyone, including our potential adversaries, will gain increasing access to the same commercial technology base. The military advantage goes to the nation who has the best cycle time to capture technologies that are commercially available; incorporate them in weapon systems; and get them fielded first.

IMPROVING THE ACQUISITION PROCESS

The real center of gravity for the revolution is an improved acquisition process. Progress along this front makes us more efficient; enables the DOD to purchase off commercial lines; and allows us to buy more with less. To make the system truly responsive, we must "un-learn" some of the accumulated collective behaviors we have "learned" over the years. My immediate goal is to create a climate of reasoned, well informed risk-taking by our program executive officers and system program directors. I solicit your support to help me shift from an environment of regulation and enforcement to one of incentivized performance.

MODERNIZATION AND RECAPITALIZATION

Reduced costs and shortened lead times are the principal benefits of the "Revolution in Military Acquisition Affairs." This revolution supports the Department's long term financial plan. It will determine, to a large extent, what the DOD will spend on RDT&E, procurement, operations and maintenance over the Future Years Defense Program (FYDP) and beyond.

In the short term, Secretary Perry made the conscious decision to bring our total budget and force structure down while maintaining the high state of readiness needed

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to support increased operational tempos. During this transient period, the focus of the Department's modernization effort has been on those force enhancements essential to meeting the demands of this strategy. Science and technology (S&T) efforts have been sustained, but overall procurement spending has been reduced to approximately 35 percent of the 1985 peak level. These actions are prudent in the near term, because past investments are adequate to sustain a force as it is being downsized.

Our current level of investment -- it is a little over $39B in procurement and about $34B in RDT&E in our FY96 budget submission -- will not sustain the Bottom Up Review (BUR) force over the long term. During the period of the current FY96-01 Future Years Defense Program (FYDP), the Department's investment focus must transition to a broad modernization and recapitalization effort. Budget authority for procurement in FY 2001 is projected to be 47 percent higher than in FY 1996. The objective of this effort will be to systematically upgrade and replace portions of the Department's capital stock. It is important to stress that the Department does not need to implement a one-for-one platform replacement of all current inventories. The Department's modernization and recapitalization program will be executed by:

- Injecting new technologies through service life extensions and technological insertions to modernize existing platforms, systems, and supporting infrastructure;
- Introducing new systems and concepts that substantially upgrade U.S. war fighting capabilities;
- Replacing, on less than a one-for-one basis, older systems with incremental improvement in reliability, maintainability and performance.

My principal responsibility as the Under Secretary for Acquisition and Technology is to work closely with the JROC to insure the Department fields effective, technologically superior weapon systems at an affordable cost. The future readiness and effectiveness of U.S. forces will be determined by today's investment in a relevant technology base, creation of suitable "technology ramps," and initiation of a sustainable procurement program.

AIR WARFARE

In the realm of Air Warfare, the Department is continuing to size and refine its capability to meet the requirements of two nearly simultaneous major regional conflict as well as provide overseas presence. Acquisition programs to support these objectives include fielding 20 B-2 bombers with improved conventional attack capabilities and development of the Air Force F-22 fighter and Navy/Marine Corps F/A-18 E/F fighter/attack aircraft. For the longer term, efforts will focus on defining the family of aircraft that will evolve from the Joint Advanced Strike Technology program.

Improvements are also being made in the air-to-air- and air-to-ground weapons carried by combat aircraft. Future air-to-air weapons will include enhanced versions of both the AMRAAM and the Sidewinder. New air-to-ground weapons with increased standoff range and improved all weather accuracy will provide significant benefits in future combat operations.

Aerial refueling is critical to the effective employment of aviation forces. Aerial refueling aircraft for in-theater employment include Air Force long-range tankers as well as Navy and Marine Corps tactical aircraft. Additionally, a portion of the Air Force KC-10 and KC-135 fleet is being modified with multipoint refueling capability to increase the Air Force ability to refuel Navy, Marine Corps and allied aircraft in flight.

Mobility enhancements in airlift are another critical element in overall capability. Airlift investments in the coming years will focus on replacing the aging fleet of C-141 intertheater airlift. The C-17 procurement is one element. A review by the Defense Acquisition Board will examine the results of both the C-17 program and the NDAA competition. Through this approach, the Department expects to reach a decision on the most cost-effective mix of airlift aircraft for meeting future needs. Enhancements in intratheater capability will come with the introduction later in this decade of the new J version of the C-130 tactical transport.

F-22

The F-22 is our next generation air superiority fighter aircraft that will replace the F-15. The F-22 will ensure U.S. dominance in the air, and pose a powerful deterrent to aggression. With the downsizing of U.S. military force structure, it will be critical for our forces to pack a more lethal punch into a smaller package. Air superiority will continue to be a prerequisite for success in all other military operations. The F-22's incorporation of stealth, supercruise, agility, and advanced avionics, combined with the superior skills of our pilots, will permit U.S. aircraft to achieve first-look, first-shot, and first-kill. This dominance in the air will allow our air, ground, and naval combat commanders the freedom to engage the enemy at the time and place of our choosing.

The F-22 also possesses significant ground attack capabilities that will permit the joint force commander to employ the aircraft against a wide variety of targets. The combination of capabilities embodied in the F-22 will allow the conduct of air superiority more efficiently, with greater assurance, and with substantially fewer losses than with current systems. Our dominance in the air is being challenged by the emergence of foreign capabilities. Many foreign aircraft systems are at parity with the F-15, and the F-15 is vulnerable to some surface-to-air missiles which are possessed by potential enemies.

The F-22 successfully conducted a competitive demonstration/validation program in the 1986-1991 time period. Approval to enter the engineering and manufacturing development (EMD) phase was granted in August 1991. The EMD program is progressing quite well. As with all development programs some technical and fiscal challenges have arisen. However, the difficulties thus far have been relatively minor compared to prior fighter developments. This may be due in part to the integrated product team approach being employed by the service and the contractors on the program. The engine, air vehicle weight, and radar signature efforts have been the most challenging thus far.

At the request of the Congress, the Department recently concluded an independent Defense Science Board (DSB) review of the concurrency and risk in the F-22 program. The DSB concluded that the program has acceptable concurrency, and the risks associated with entry into rate production are readily controllable through

monitoring and enforcement of the key demonstration tests incorporated in the program plan. The air vehicle Critical Design Review was completed on time last month, and there were only twelve open items that needed to be brought to closure prior to release of all final drawings for the fabrication of the development flight test aircraft. These open issues are expected to be resolved by June 1995. This is outstanding for a program this large and complex.

Joint Primary Aircraft Training System (JPATS)

JPATS is the key to implementing joint fixed wing pilot training for the Navy and Air Force, as directed by the Secretary of Defense. JPATS includes aircraft, a ground based training system, and contractor logistics support. The JPATS aircraft will replace the aging Air Force T-37 and the Navy T-34C primary trainers, both of which have significant performance and supportability deficiencies. JPATS will offer greater pilot safety, as well as greatly increase accommodation of women in primary trainer cockpits. The Air Force plans to acquire 372 aircraft and the Navy will acquire 339. Initial Operational Capability for the Air Force is planned for FY00, with the Navy to follow in FY03. JPATS is a DOD Acquisition Pilot Program currently in source selection. The successful offeror will be announced in June 1995, with contract award in August 1995.

Joint Surveillance Target Attack Radar System (JSTARS)

JSTARS is a joint Army and Air Force program, with the Air Force as the lead service. Its purpose is to field a common battle management and targeting capability to detect, locate, classify, and track moving and stationary targets for situation assessment to avoid surprise and to attack targets out to the range of existing and developing weapons. The joint Army/Air Force objective is to develop a radar, airborne battle management workstations, airframe, data link, and ground stations that will provide the capability to locate, track, and classify tracked and wheeled vehicles beyond ground line-of-sight during the day and night and under most weather conditions. Radar data are distributed to the ground station modules (GSMs) via a secure surveillance and control data link.

The Air Force is developing and producing the air component of JSTARS (E-8C) while the Army is developing and producing the GSMs. The E-8C aircraft is in its

third year of low-rate production of two per year, with a total inventory objective of 19 aircraft and total program cost of $8.6B. The Army's low-rate production program is also in its third year and includes the 12 medium GSMs mounted on five-ton trucks and light GSMs mounted on HMMWVs. Total Army program cost is $1.6B with total inventory objective of 104 GSMs. The low-rate production program is planned to continue in FY 1996 while the joint multi-service operational test and evaluation is completed. IOC is slated for March 1997.

JSTARS flight test aircraft were successfully employed in Desert Storm and flew numerous demonstration missions in Europe last year during the EUROSTAR demonstrations. We are actively engaged in discussions with NATO allies regarding the potential purchase of JSTARS to complement the NATO AWACS capability. The NATO Military Committee endorsed the requirement for an Alliance Ground Surveillance capability, and NATO established a small, full-time project office in Brussels. In the next 6-18 months, we are working toward agreement for a NATO-owned, jointly operated system with JSTARS as the core candidate.

F-18E/F Hornet

The F-18 E/F program is the key to the near-term modernization of Naval Aviation, providing significant enhancements to the combat proven F-18 C/D. The E/F will provide greater range, loiter, weapons carriage, carrier operational suitability, and survivability. In addition, it will arrive with significant future growth potential designed in. The C/D models, in contrast, are now at their maximum capacity for avionics cooling, electrical power, and weight.

This program is in Engineering and Manufacturing Development, with the first developmental airframes currently under construction. In accordance with the RDT&E cap of $4.8 billion imposed by the Congress, the program is fully funded and on schedule for IOC in 1998. The final C/D procurement will be in 1996, with all future Hornet procurement planned for the E/F. The E/F passed its critical design review in June of this year, and is on schedule for first flight at the end of 1995.

F-14 Upgrade

The current F-14 program consists of a modest upgrade of strike capability for 251 airplanes. Identified as F-14 Precision Strike Upgrade, it builds upon the survivability and service life investments currently underway. The Precision Strike Upgrade program will enhance the striking power of the F-14 fleet, which at present has daylight, iron-bomb capability only. It will provide 14 additional PGM capable multi-role fighters to each carrier air wing. This enhancement is especially important as the A-6 fleet retirement is completed in 1997. With the F-14 day and night precision strike capable, each wing will have 50 multi-role aircraft for its power projection role, 36 F/A-18 Hornets and 14 F-14 Tomcats. This multi-role capability is particularly valuable for the carrier forces, where limited real estate on the flight and hangar decks argues persuasively for an on-call contribution of both air-to-air and air-to-ground effectiveness from every possible platform.

A Cost and Operational Effectiveness Analysis was recently completed on options for achieving the desired F-14 enhancements. A Navy decision defining the new configuration is planned for June 1995. Both a JDAM-only configuration and a FLIR/Laser Targeting Pod capability are under consideration. Preliminary estimates indicate that this program can be accomplished at a total cost of less than $300 million, with IOC in FY 2000. The funds requested in the 1996 budget include $25.4 million for development.

Tomahawk Cruise Missile

Tomahawk is capable of autonomous precision strikes deep into unfriendly territory, as well as sustained salvos in combat. Each succeeding improvement expands the target base for this weapon and our ability to strike at the heart of an enemy's capacity to sustain combat, with the obvious effect of reducing the potential for loss of air crews over hostile territory.

In 1995, we will make an incremental improvement to the weapon system with the introduction of the Tomahawk Precision Strike Initiative. In 1994, we began an Engineering and Manufacturing Development (EMD) contract for the Tomahawk Baseline Improvement Program (TBIP) development, which will give Tomahawk increased accuracy and reliability, with reduced collateral damage by the year 2000.

The introduction of the Afloat Planning System, Theater Mission Planning Center Upgrade, and the Advanced Tomahawk Weapon Control System all serve to make Tomahawk a quick-reaction, tactical-strike weapon. RDT&E funding in FY96 of $146.6M supports the TBIP program EMD. In production, we have singled up Tomahawk procurement to Hughes Missile Systems Company. This single-up acquisition strategy resulted in FY 1994-1999 procurement savings of over $500 million. The FY 1996 request of $162M is for 164 Tomahawk conventional Block III missiles.

LAND WARFARE

Comanche

In December 1994, the Department decided to restructure Comanche and defer production. The Army responded to that decision by proposing a program that included two prototypes and six additional Early Operational Aircraft for user evaluation. The program puts aircraft in the hands of soldiers toward the end of the century. This concept gets real world experience fed back into the aircraft developmental process. This concept was made possible by deferring weapon systems integration. The six aircraft will have key technologies such as a second-generation Forward Looking Infrared device, advanced aided target detection, and low observables, which are critical to accomplishment of the Comanche's primary reconnaissance mission.

I support the Army's approach which will assess Comanche's potential benefit to the Army as well as broader applications in the joint arena. Last week, I approved the Army's restructured approach and all FY 95 funding has now been released to the Army to execute the restructured program.

Advanced Field Artillery System (AFAS)/Future Armored Resupply Vehicle (FARV)

Crusader, formerly called Advanced Field Artillery System (AFAS) and Future Armored Resupply Vehicle (FARV), is the Army's next generation indirect fire cannon and artillery resupply system for the heavy force. This system will provide an

overmatching firepower capability which will support the force commander's goal of dominating the maneuver battle and protecting the force. Crusader will incorporate advanced technologies to increase accuracy, rate of fire, survivability, mobility, and ammunition handling speed; and to decrease crew size. When fielded, Crusader will displace the M109A6 Paladin Self-Propelled Howitzer and M992 Field Artillery Ammunition Supply Vehicle in Rapidly Deployable and Forward Deployed Forces.

The self-propelled howitzer (SPH) will improve the range of 155mm cannon artillery to 40 kilometers unassisted and 50 kilometers with assisted projectiles. It will increase the current burst rate fire from four rounds per minute to 10-12 rounds per minute. It will increase the payload, and improve accuracy, survivability and reliability, availability, and maintainability over current howitzer systems while reducing the overall howitzer section size from 4 to 3. SPH will be capable of cross-country and highway speeds equal to the mobility of the supported M1 and M2 force. SPH will incorporate an automatic ammunition-handling system and a new regenerative liquid propellant gun to achieve the longer ranges and higher rates of fire.

The resupply vehicle (RSV) is the companion ammunition resupply vehicle to SPH and will resupply ammunition and fuel for SPH. Inserting high-payoff technologies in robotics, automation, expert systems, vetronics, and improved ammunition propulsion into the resupply process, the FARV will provide the necessary ammunition to meet the expected firing rates, meet the goals for autonomous operations, and capitalize on cost and operational advantages of component commonalty. RSV will have an ammunition capacity between 130 and 200 rounds, and will be capable of automated rearming and refueling operations, protected under armor. This automation will enable the crew size to be reduced from 5 to 3.

I have approved Crusader's entry into the Demonstration/Validation phase of development as a single program. The Army awarded a letter contract to United Defense Limited Partnership on December 29, 1994.

Combat Vehicle Improvement Program

In response to deficiencies highlighted during Operation Desert Storm and projected increases in regional threats, the CVIP provides continued modernization of the Army combat vehicles. Improvements to the firepower, mobility, fightability and survivability of combat vehicles continue to be required. A key thrust of the CVIP is "Horizontal Technology Integration" (HTI) wherein common technologies are integrated across the various types of combat vehicles rather than developed as unique, stovepipe solutions.

One example of HTI is the 2nd Generation Forward Looking Infrared (2nd Gen FLIR) program. For 2nd Gen FLIR, a common detector will be integrated into the sights of the M1A2 tank (two sights), M2A3 Bradley (two sights), and the Armored Gun System (AGS) (one sight). Development of the common components, integration of the components into the vehicles, and testing will occur from present through FY98. Production cut-in is planned for FY98, and First Unit Equipped dates are FY00 for Abrams, FY00 for Bradley, and FY01 for AGS.

Digital Command and Control improvements will also be developed for the M2A3 Bradley and the M1A2 Abrams tank. These improvements, will also be fielded in FY00.

The development of the M88A2 Improved Recovery Vehicle and the Bradley Fire Support Team Vehicle (FISTV) correct two critical deficiencies identified during Operation Desert Storm -- inadequate recovery capability and inability of the M113 FISTV to keep up with the Abrams and Bradley maneuver forces. The M88A2 Milestone III is scheduled for 4Q96, and the Bradley FISTV Milestone III is scheduled for FY00.

Multiple Launch Rocket System Improvement Program

The primary missions of the Multiple Launch Rocket System (MLRS) are counterfire and suppression of enemy air defenses, light materiel and personnel targets. The MLRS is a free-flight area fire, artillery rocket system which supplements cannon artillery fires by delivering large volumes of firepower in a short time against

critical, time-sensitive targets. The MLRS M270 launcher is being upgraded to accommodate a new MLRS family of munitions (MFOM), including the Army Tactical Missile System.

MLRS performed extremely well in Operation Desert Storm (ODS) in which significant numbers of launchers were deployed. All operational requirement were met and, in most cases, exceeded levels for readiness, reliability and maintainability. MLRS units from the United Kingdom were also involved in ODS and proved the value of this multi-national system. The new upgrade MLRS (Deep Attack Launcher) also demonstrated its enormous capability during the first operational firings of the longer range ATACMS.

The Army has initiated an extensive improvements program to enhance MLRS's basic capability. The improvements are in three areas--an extended range rocket (from 32 kilometers to 50 kilometers), an improved fire control system, and an improved launcher mechanical system. The extended range rocket has a reduced payload of M77 submunitions and a longer rocket motor to enable attainment of the additional 18 kilometers of flight. The improved fire control system includes a meteorological sensor, a positioning navigation unit combined with global positioning system and a new launcher interface unit with increased throughput capacities in the main and communication processors. The improved launcher mechanical systems consists of non-developmental item improvements to the elevation transmission, elevation motor, azimuth motor and motor control.

Army Tactical Missile System (ATACMS)

Deep attack systems provide the ground commander with an advanced, non-nuclear family of long range missiles and munitions to attack maneuver, command and control, and air defense assets, key logistic facilities, and surface-to-surface missile launchers. Deep artillery fires, rapidly shifted laterally or in depth, disrupt and destroy threat forces and long-range weapons before they influence the battle. The key component of the Army's deep attack capability is the Army Tactical Missile System (ATACMS) carrying either Anti-Personnel/Anti-Materiel (APAM) or BAT smart submunitions. The ATACMS fires from the Multiple Launch Rocket System (MLRS) M270 launchers.

ATACMS is the first modern conventional deep attack missile fielded since the introduction of Lance in 1972. The Block I variant attacks soft, stationary targets out to a range of 165 kilometers. In February 1993, the Army initiated a product improvement of the ATACMS Block I missile (designated Block IA). The improvement incorporates the Global Positioning System (GPS) and a lighter payload to extend the range of ATACMS to 300 kilometers with improved accuracy. In November 1993, the Army was directed to develop an alternative carrier for the BAT submunition in light of the termination of the Army's Tri-Service Standoff Attack Missile (TSSAM). The Army chose a variant (BlockII) of the ATACMS missile. ATACMS Block II incorporates 13 BAT (or P3I BAT) submunitions into the missile with a range of 140 kilometers.

V-22

The V-22 is a tilt-rotor aircraft designed to meet the amphibious/vertical assault needs of the Marine Corps, the Combat support and Combat Search and Rescue needs of the Navy, and the long-range infiltration and exfiltration missions of the United States Special Operations Command. The V-22 will be capable of flying over 2100 nautical miles with one aerial refueling, providing a vertical/short take-off aircraft that could rapidly self-deploy to any location in the world.

The Engineering and Manufacturing Demonstration contract was definitized in May 1994, and the V-22 completed the first Operational Assessment in July 1994. Last December, my office approved an acquisition strategy which includes initial production of both the Marine Corps variant (MV-22) and Special Operations Command variant (CV-22) and requested that the Defense Science Board (DSB) convene a Task Force to review cost-reduction strategies to lower unit cost. The DSB Task Force has completed its work and we are considering its recommendations.

NAVAL WARFARE

To ensure a capable and ready force for the future, the Department of the Navy is pursuing a recapitalization plan for the selective modernization of the fleet. Recapitalization aims to create an investment program in which sufficient new acquisitions are funded on a continuous basis to offset the capability lost through the

disposal of older equipment. The initiatives planned will maintain a robust, albeit smaller, maritime force structure while hedging against uncertainties in the threat.

Examples include the construction of our first Flight IIA ARLEIGH BURKE-class guided-missile destroyer; construction of CVN 76, our tenth nuclear-propelled aircraft carrier; the Navy's Cooperative Engagement Capability, a program that the Secretary of Defense directed to be accelerated due to its critical role in joint battlespace situational awareness; introduction of the LPD-17 amphibious transport dock ship, programmed to begin in FY 98; increasing the Sealift and Maritime Prepositioning Force; the SEAWOLF-class submarine program, which will assure continued battlespace dominance well into the next century; and the New Attack Submarine, which will more affordably maintain that dominance.

Ship Self-Defense Program

The Ship Self-Defense (SSD) program gives non-AEGIS equipped ships the ability to operate safely in the littoral environment, defending themselves against attacks by aircraft and anti-ship cruise missiles, through the integration of existing and future sensors and self-defense weapon systems. The SSD program adds engagement, sensor, and electronic warfare systems and upgrades while exploiting capabilities of those systems already in the fleet.

The program has three coordinated efforts. First, procurement and installation of existing systems, including Close-In Weapons System (CIWS); RIM 7P surface-to-air missile; Rolling Airframe Missile and Infrared Mode Upgrade (IRMU); AN/SLQ-32 electronic warfare system; AN/SPS-49 radar; and signature reduction measures. Second, modular Local Area Network architecture for optimization of ship self-defense elements via multi-sensor integration, automated detect-to-engage, multi-weapon control, and hardkill/softkill integration. Third, development of advanced capabilities. New technology leveraging will include active phased arrays, missile guidance/fuzing/propulsion, and offboard active countermeasures. New systems will include Precision ESM, AN/SPQ-9B radar, Infrared Search and Track, Thermal Imaging Sensor System, Evolved Seasparrow, and CIWS upgrades.

C3I AND SPACE SYSTEMS

DOD is evolving from a cold war posture to a smaller, more mobile and more flexible force and infrastructure capable of projecting power anywhere in the world on short notice. At the same time, the Department is positioning itself to engage in a much broader spectrum of missions, ranging from deterrence and regional conflict to peacekeeping and humanitarian assistance. Command, Control, Communications, and Intelligence (C3I) systems are a vital element in successfully conducting the potential missions and operations of a post-cold war future.

Advances in technology and changes in military doctrine require that our C3I systems undergo continual modernization. Accordingly, modernization remains a priority for our C3I programs even under the fiscal constraints facing the Department. To this end we are continuing to move ahead with the modernization efforts needed to ensure our C3I systems provide the secure information capabilities needed by war fighters and other command authorities to effectively and successfully prosecute missions anywhere in the world. Specific examples include:

- improving the Airborne Warning and Control System (AWACS) in the areas of radar range and reliability, identification, communications, and navigation to help ensure that this vital platform will be fully responsive to future needs;

- continued fielding of Single Channel Ground and Airborne Radio System (SINCGARS) combat net radio to provide a secure, jam-resistant capability that is lacking with the current VHF radio system; and

- fielding of the Joint Tactical Information Distribution System (JTIDS) to provide a high capacity data communications capability to support defense against aircraft and tactical ballistic missiles.

The United States conducts a variety of activities in space in support of national security objectives. DOD space forces support a wide range of requirements critical to the National Command Authorities, combatant commanders, and operational forces. The global coverage, high readiness, non-intrusive forward presence, and responsiveness of space forces enable them to provide real-time and near-real-time

support for the full range of military operations in peace, crisis, and across the entire spectrum of conflict.

Space forces are fundamental to modern military operations. They are playing a central role in the ongoing revolution in warfare because of their unique capabilities for gathering, processing, and disseminating information. In particular, space systems provide force multipliers that are increasingly important for sustaining an effective level of U.S. defense capability as overall force structure is downsized and restructured. The space modernization initiatives I will present to you today will help to ensure that DOD space forces will retain the capability and versatility to accomplish their missions effectively and efficiently in support of national security strategy and national military strategy.

Battlefield Combat Identification System (BCIS)

The Department has adopted a multifaceted strategy in response to the armor fratricide that was suffered in Operation Desert Storm. Simple devices, including flashing laser beacons and reflective panels, have already been purchased as a "Quick Fix" for this problem. At the National Training Center, increasing emphasis is being placed on identification, which has resulted in significantly lower fratricide in exercises. Regarding more sophisticated materiel solutions, the Army tested a number of "off-the-shelf" systems in 1992 as candidates for near-term application and selected a millimeter-wave approach, which evolved into BCIS.

Initial development tests of the system show very good results in ground-to-ground applications. However, BCIS is not inexpensive, and before the Department commits to a large investment in the system, we intend to evaluate alternative approaches. A number of such concepts have been identified by the Combat Identification Task Force, which I established last year to study the overall issue of identification. We are considering a plan that would include an Advanced Concept Technology Demonstration (ACTD) on BCIS in early 1997, as well as advanced Technology Demonstrations (ATDs) of competing concepts in the same time-frame. Following these demonstrations, the Department will be in a position to make an informed decision on both the near-term and long-term approaches for this important

requirement. At the same time, we will have kept the BCIS program moving so that we could procure the system quickly should events warrant.

Army Digitization of the Battlefield

The Army digitization effort is a vital part of the larger process of redesigning the Army to meet the challenges of the 21st century. This larger process, called Force XXI, focuses on the underlying concepts and design of the operational and institutional Army. The capabilities called for are tailored to allow the smaller force projection Army to more effectively and decisively concentrate battlefield combat power. The intent is to enable fewer and smaller contingency force units to be more lethal and survivable in an environment characterized by an accelerated operational tempo demanding instant communications and immediate response times. Fundamental capabilities required include automated, high-speed exchange of digitized information, fusion and display of intelligence data to commanders at all levels, rapid exchange of targeting data from sensors to shooters, and near-real-time picture of commanders' battlespace.

In order to achieve the benefits that digitization will bring to the battlefield, it is essential that all weapons systems be equipped with a digital capability. While some of the newer weapons systems have this capability, most do not. If the Army waits for the normal replacement of weapons systems to drive the introduction of digital capabilities across the force, it could not realistically be accomplished until well into the 21st century and at a potentially prohibitive cost. Since very few systems possess a digital capability now, the capability must be added as an "appliqué". In addition to the appliqué hardware, common application and support software (CASS) will be provided. The software will meet open systems standards and be non-proprietary except under the most compelling circumstances. It will be forward compatible with the mainstream of commercial hardware and software developments to allow ease of new technology insertion.

In the near and mid-term, a series of planned Advanced Technology Demonstrations (ATDs), Advanced Concept Technology Demonstrations (ACTDs), and Advanced War fighting Experiments (AWEs) will serve as the technical and doctrinal testing grounds for digitization.

AWACS Radar System Improvement Program (RSIP)

The RSIP program was initiated in 1989 to preserve the range capability against smaller cross-section targets like cruise missiles and low-observable aircraft, and to significantly improve the reliability and maintainability of the aging radar design. We experienced nearly a year's delay in development due to the complexity of the software, but have since surmounted that difficulty. The system is showing good performance in development tests, which are nearly complete, and we expect to begin initial operational tests this summer.

RSIP has been developed in cooperation with NATO, and the Alliance will apply the similar radar improvements to their fleet of 18 AWACS aircraft. We are now negotiating with NATO for cooperation in the production phase.

Air Force Satellite Control Network Improvement and Modernization (I&M)

The Air Force Satellite Control Network (AFSCN) is the largest, most diverse satellite control network in the world. The modernization is focused on two major areas: Command & Control Upgrades and Communications Upgrades. The main thrust of the upgrades is to eliminate non-standard unsupportable equipment and replace it with less expensive, more capable commercial hardware and software. The modernization will eliminate costly mainframe computers and their expensive software by replacement with a distributed server-workstation architecture in our satellite control centers. The current modernization effort is estimated at $420 M (FY 95-01), and will payoff with estimated savings of $75 M/year beginning in FY 02. Included in the above savings is a reduction of almost 600 government personnel. These modernization efforts also enable additional modernization for unattended remote tracking station operation, which will result in further savings. These efforts were the subject of intense GAO Review during the past year, culminating with support of the AFSCN modernization effort.

The other third of the budget request is for support of accommodating new and changed missions into the network. Additional efforts also support new systems in the classified arena.

Milstar

The Milstar satellite system is planned to provide operational forces -- especially highly mobile tactical units -- with secure, survivable, flexible communications on a world-wide basis. The Milstar system operates in a currently under utilized part of the radio spectrum – Extremely High Frequency (EHF). This attribute plus other design features, like advanced signal processing and cross links, provide unique mission capabilities -- capabilities required by today's war fighters for power projection into possible theaters of conflict around the globe.

The Department restructured the Milstar program extensively four years ago, at Congressional urging, to reduce costs and to account for changes in the international and national security environments. Requirements for a classified payload were deleted "Heroic" survivability features envisioned for the Cold War environment were eliminated. The number of satellites and ground control elements were reduced commensurate with the threat and force structure reductions.

A higher capacity, Medium Data Rate or MDR payload is being developed for the second generation Milstar II satellite which expands its tactical utility. This MDR payload will greatly increase communications capacity compared to the Low Data Rate (LDR) capabilities on the initial Milstar I satellites. Use of both LDR and MDR will greatly enhance the utility of Milstar II satellites in a wide range of future scenarios.

The restructured Milstar program also reduced the numbers of strategic terminals and defined new mobile terminals for tactical users. It reduced program life cycle costs by approximately 25 percent. We reviewed the program in 1992 under the context of a DAB for this restructured system and then again in 1993 as a portion of the Bottom-Up Review (BUR). In both reviews we continued to reduce the program and have now arrived at a system design which represents a savings of nearly 50% versus the program defined back in 1991.

The current program, comprised of two Milstar I satellites and four follow-on, Milstar II satellites is the result of extensive analysis during the BUR and retains solid

support from all sectors of the DOD. The first Milstar I satellite was launched last year and has undergone initial testing very successfully. We used a planned break in testing to support our forces during Operation Restore Democracy in Haiti. Using prototype terminals we had already procured, the Army forces on the ground were able to talk directly to the deployed command ship and their home base anytime, without any dependence on terrestrial infrastructure. The satellite is now in final IOT&E.

The second satellite is scheduled for launch later this year and everything looks great at this time. We also completed a very successful critical design review on the MDR package. Finally, we placed the last two Milstar satellites, numbers 5 and 6, on contract.

The Milstar terminal programs are proceeding along as well. The Air Forces command post terminal and the Navy EHF terminal programs were largely unaffected by the changes in the satellite design and have been in production for some years. Installation operations are proceeding smoothly. We revamped the Army terminal program after the Milstar program was redefined, initiating two new efforts following the 1992 DAB: the Single Channel Anti-Jam Man Portable (SCAMP) terminal and the Secure Mobile Anti-Jam, Reliable Tactical Terminal (SMART-T). Through last year both developments were on track and below their program baseline budgets.

Unfortunately, the Army SATCOM Ground Environment budget took a large cut, 50% of its RDT&E, in the FY 95 appropriations bill - a cut aimed squarely at these two efforts. We judged it overly risky to proceed with both development programs on a reduced budget so we had to make a tough choice. The Army worked with industry, the rest of the Milstar team, and OSD to fashion a new strategy that would minimize the effect of the cut. They arrived at a solution that terminated the SCAMP development effort and instead cast it as a competitive production effort. The new strategy retains the previous schedule for terminal production although we've had to accept slightly increased program risks and reduce some of the baseline requirements.

SPACE TRANSPORTATION

Medium Launch Vehicles

The Medium Launch Vehicle (MLV) program is a key to the DOD mission of maintaining assured access to space. This robust mix of expendable launch vehicles, consisting of the Titan II, Delta II, and Atlas II have proven to be dependable workhorses in launching DOD and National User payloads. The Delta II has successfully placed the Global Positioning System (GPS) Block II/IIA satellites into their proper orbits thereby completing the global navigation constellation. Since February 1992, the Atlas II program has successfully launched four Defense Satellite Communications System (DSCS) Block III satellites to maintain our global communications network. In the future, the MLV program will launch the GPS Block IIR satellites, four more DSCS satellites, a Space Test Program satellite, National User payloads, and will continue to support NASA launch operations.

Our strategy is to make only modest investments in these systems for flight safety and to reduce cost where we can realize a near-term savings. We have no plans to refurbish additional Titan II's beyond the original fourteen under contract. At this time we have firm requirements for six of the Titan II's in addition to the five already flown which leaves a balance of three unassigned. We plan to fly out the six by 1999, with two launches planned in fiscal 96 in support of NOAA and DMSP, and then shut down the Titan II operation. Delta and Atlas will continue to be prime launch vehicles through the early part of the next decade until we can transition to the MLV class of the Evolved Expendable launch Vehicle or EELV in 2001.

Titan IV

Until the heavy-lift EELV capability comes on line to support National User payloads after 2005, Titan IV remains this Nation's only capability to place our highest priority, heaviest payloads into polar and geosynchronous orbit.

As a result of a Defense Acquisition Board program review last year, the size of the program was reduced from 65 vehicles to 47. I plan to review the acquisition strategy for the follow-on buy, vehicles 42 and beyond, later this year. The Air Force

plans to award a contract for the follow-on program in fiscal year 1997. I believe this additional buy of six vehicles will be adequate to get us through the transition to the heavy-lift version of the EELV, but I would like to preserve the option to add additional Titan IV vehicles beyond the six planned as a prudent hedge against the EELV schedule. My intent, however, is not to ever have to execute that option. The Air Force plans to award a contract for follow-on launch operations and issue the request for proposal for the follow-on production in FY 1996.

Evolved Expendable Launch Vehicle

The next part of our launch vehicle strategy involves the replacement for the current systems. We have recently issued a draft request for proposal (RFP) for the Evolved Expendable Launch Vehicle or EELV. The number one objective of this program is to reduce cost. This program is one of the recent examples of what we in the Department are doing about acquisition streamlining. I first reviewed the Air Force EELV plan on February 16 and approved their overall concept and directed they prepare for a DAE review. That review is currently scheduled next month. Clearly, not business as usual. The EELV acquisition plan calls for three phases. The first is a 15-month risk reduction phase where we will award multiple contracts to primes. At the end of this phase we will down select to two and enter a 13-month pre-engineering and manufacturing development phase. At the end of that phase we will down select to one and enter the EMD phase. Prior to entry into each of the phases I will hold a DAE review.

As I am sure you are aware, the Secretary was directed to provide two reports to the Congress regarding EELV. One deals with the use of Russian technology and the other a detailed plan describing the proposed development program for the new family of expendable launch vehicles. The Department policy on the use of Russian technology for EELV is currently in coordination within the Department. It is our intent to forward this policy to the Congress within the next few weeks. As reported in the press, the basic tenet of the policy is a "no dependence" clause. We will require that within four years of final contract award, U.S. industry must develop an in-house production capability. This period of time is consistent with the continued production capability of current systems so that we maintain a fall-back if for whatever reason we cannot produce the engines within the US.

The detailed plan describing the EELV program is currently in coordination. I expect it to be forwarded to the Congress soon after the program review next month.

TECHNOLOGY RAMPS

Today's leading edge systems were made possible through decades of investment in fundamental science and exploratory development work. The technology ramps initiated in the early-60's and sustained in the mid-70's gave us the stealth aircraft, precision guided munitions, and night vision systems that provided U.S. forces with a decisive combat edge during the 1991 Gulf War.

The Air Force's F-117 stealth fighter, one of the high-value strike weapons of the war, provides a good illustrative example of the need for stable, long term investment in key enabling defense technologies. The F-117 became operational in 1983 -- in ample time for the Persian Gulf conflict. However, the key enabling technologies for this system can be traced to a mathematical formulation of radar scattering geometries and the development of radar absorbing materials that date back to the early 1960's. During the 1970's, the Department's investment in 6.2 exploratory development produced new titanium alloys, better compressor seals, stealth nozzle designs and many other technologies needed for the Defense Research Projects Agency (DARPA) to build two HAVE BLUE prototypes -- the proof of concept flight demonstration vehicles for what would become the operational F-117 six years later.

To maintain the technological edge of U.S. forces, the Department must continue to establish stable and sustainable technology ramps for tomorrow's systems. The President's FY 1996 budget submission contains $7.6 billion for the Department's 6.1/6.2/6.3 S&T programs (excludes BMDO S&T programs). Although the FY 1996 amount is about $800 million or about 10% less than the FY 1995 appropriated level, it returns the Department's investment in S&T to a more sustainable real growth profile over the long term -- one more consistent with the historical norms established over the past 30 years. Budget authority for science and technology in FY 2001 is projected to be 18 percent higher, in then year dollars, than in FY 1996.

TECHNOLOGY PROGRAM

The Director of Defense Research & Engineering (DDR&E) is responsible for overseeing both the content and execution of the Defense S&T Program. Over the past year, the DDR&E developed and published the *Defense Science and Technology Strategy* and the *Defense Technology Plan* in conjunction with the Military Departments and Defense Agencies. Together, these companion documents provide a single integrated summary of the Department's overall S&T vision, strategy and program content.

In turn, each of the Military Departments and Defense Agencies organize and manage the execution of their individual S&T programs within this overarching framework. The resulting diversity in management approaches provides a robust capability and alternate methods for tackling emergent issues. All of these organizations, under the leadership of the DDR&E, work closely together to:

- establish technology "on-ramps" that are responsive to the warfighter's needs;
- review soundness of technical and programmatic approaches;
- coordinate allocation of resources;
- prevent duplication and overlap;
- execute an integrated, comprehensive program;
- guard against technological surprise.

The Department's technology "on-ramps" are a collection of individual technology programs in research categories 6.1/6.2 (basic research/exploratory development) and 6.3 (advanced development). These efforts are linked in a technology insertion road map to specific weapon system acquisition programs, either a new start or system upgrade, to satisfy the warfighter's stated mission needs. For example, the next generation of air-to-air missiles is supported by a broad range of Air Force, Army and Navy research category 6.2 exploratory development projects to develop improved seeker, warhead, fuzing and solid rocket motor component technologies. The path for insertion of these new technologies in an improved Advanced Medium Range Air-to-Air Missile (AMRAAM) is through a research category 6.3 advanced development program, typically an Advanced Technology Demonstration (ATD), to prove the feasibility and military utility of the approach selected.

The Department has established a new mechanism in research category 6.3, called an Advanced Concept Technology Demonstration (ACTD), to rapidly transfer technology to the users. ACTDs are user-oriented, even user-dominated. An ACTD is an integrating effort to assemble and demonstrate a significant, new military capability. It is based upon mature advanced technologies – at a scale size adequate to establish operational utility and system integrity. The demonstration is jointly implemented with the operational user and materiel development communities as key participants. ACTDs allow the war fighting user to:

- evaluate the military utility of the technology before committing to a major acquisition effort;
- develop concepts of operation for employment of the new technology;
- retain a low-cost residual operational capability.

Military needs drive the direction and resource allocation priorities of the Department's S&T program. The Joint Staff and the JROC have identified five "Future Joint War fighting Capabilities" most needed by the U.S. Combatant Commands for coping with the post-Cold War world. These five future war fighting needs are:

• *To maintain near perfect real-time knowledge of the enemy and communicate that to all forces in near-real time.* War fighters need to know where the enemy is, what their capabilities are, where friendly forces are, and what range of actions each could execute. In addition, war fighters need timely information and intelligence products. Specifically, they require near-real time updates on meteorological, topographical, geographical, and political conditions. The Department's S&T program is emphasizing several promising advanced technology areas to achieve dominant battlefield awareness and action cycle times. Important technological advances are being pursued in: information surveillance, information management, and intelligence dissemination. The current family of Unmanned Airborne Vehicle (UAV) ACTDs is the 6.3 portion of a "technology ramp" aimed at improved airborne surveillance and reconnaissance capabilities. Three candidate FY 1995-1996 ACTD new starts are looking at innovative ways to decrease the action cycle time of U.S. forces by addressing the growing need to process, fuse, and then disseminate intelligence: (1) Semi-Automated Imagery Intelligence (IMINT) Processing; (2) Ground-Ground and Air-Ground Combat Identification; and (3) Battlefield Awareness and Data Dissemination.

• *To engage regional forces promptly in decisive combat, on a global basis.* Prompt reaction to regional conflicts has two components: global mobility and decisive combat. Technological advances in aircraft propulsion have dramatically improved the performance of Air Force "global reach -- global power" forces. The Department's 6.2/6.3 Integrated High Performance Turbine Engine Technology (IHPTET) program, budgeted at $134 million in FY 1996, is aimed at providing a 100% improvement (over the 1987 baseline) in the thrust/weight ratio of high performance fighter engines by 2003. Substantial strides are being made in the Department's 6.2 exploratory development programs to reduce the weight of "heavy" Army and Marine forces so they can be sea deployable in half the time with half the ships.

• *To employ a range of capabilities more suitable to actions at the lower end of the full range of military operations which allow achievement of military objectives with minimum casualties and collateral damage.* The principal challenge is to limit casualties and collateral damage. Advances in precision targeting and controlled destruction, particularly in settings where enemy combatants mingle with civilians, are required to limit collateral damage and casualties. The Marine Corps, Army and several CINCs are sponsoring a candidate FY 1995-1996 ACTD new start on Military Operations in Built-Up Areas. This ACTD will serve as an integrating effort to demonstrate new operational capabilities in urban settings using mature and emerging technologies from the Department's portfolio of 6.2 projects on non-lethal weapons, surveillance, sensing, target detection and situational awareness.

• *To control the use of space.* Desert Storm was the first space war. Space based systems provided coalition forces with communications, navigation, weather monitoring, threat warning, intelligence collection, and a decisive advantage in situational awareness. Technological advancements are required to insure space based communications links are jam resistant. Without assured access to and control of space, that advantage is lost. The Department has embarked on a wide range of space vehicle and booster 6.2/6.3 development efforts. The Air Force has budgeted $30 million in FY 1996 to reduce the size and weight of the Extremely High Frequency (EHF) payload on board Milstar communications satellites. Current projections indicate that replenishment of the Milstar constellation with a considerably less costly Medium Launch Vehicle (MLV)-class Advanced EHF satellite is possible by 2006.

• *To counter the threat of weapons of mass destruction and future ballistic and cruise missiles to the CONUS and deployed forces.* Weapons of mass destruction, theater ballistic missiles, and anti-ship cruise missiles present a wide range of serious threats to U.S. forces. Technological advances are needed to allow for the better detection of and defense against biological agents. The Ballistic Missile Defense Organization has a robust ballistic missile defense technology program in place to counter validated threats. The Navy is sponsoring a "Mountain Top" ACTD to demonstrate over-the-horizon detection, tracking and engagement of cruise missiles from an elevated sensor suite. A candidate FY 1995-1996 ACTD new start on Counter Proliferation will demonstrate an improved counter force capability to survey and strike weapons of mass destruction (WMD) storage and production facilities, including the planning tools for predicting collateral damage and performing bomb damage assessments.

SUMMARY

Mr. Chairman, every weapon system in the U.S. inventory today required decades of direct investment in critical enabling technologies; creation of suitable "technology ramps;" and sustainment of a coherent modernization program. These systems exist because of the technologies and concepts developed by teams of dedicated researchers at our universities, defense laboratories, test centers and industrial contractors. The DOD is committed to maintaining a legacy of technological supremacy at an affordable cost.

The Department's FY 1996 budget submission contains a prudent and relevant mix of defense research, development, test and evaluation investments. This program is needed to produce tomorrow's weapon systems. It initiates the Department's long term modernization strategy; meets the national security needs of the nation; and preserves a legacy of technological superiority for U.S. forces in the 21st Century.

I thank you for this opportunity to appear before the Subcommittee and shall be happy to answer any questions you may have.

Mr. WELDON. Thank you, Dr. Kaminski.

Why don't we take a few questions about the overall testimony you have given. Then we can get into the specific program briefing. I know members will have a number of questions about specific programs.

I have two up front that I would like to begin the discussion with. The first deals with your R&D laboratories that we have. My understanding is that we operate between 80 and 100 defense laboratories. That DOE operates another 30 laboratories; annual cost to the taxpayers is about $15 billion.

I know you have an aggressive effort underway following the Defense Science Board recommendations to downsize to consolidate. There is a feeling among some that perhaps we are not doing enough to do the same consolidation with the infrastructure.

Would you lay out for us the plan with where you are going with our laboratories, the staffing of those labs, and in particular the OSD management structure for the DOD laboratories in general?

Dr. KAMINSKI. Yes, sir; I will.

I would say first as an overall comment, while the TOA and our force structure in the Department are down about a third, our infrastructure is only down about 20 percent. Our projections to continue with the program we have in place, including the consequences of the BRAC process, is that infrastructure will come down another 11 percent overall.

It is something we have to do to be able to generate the savings to plow back into our investment program. With respect to the laboratories, we have an overall effort in place to look to restructure and make better use of our laboratories.

In terms of downsizing the laboratories, we are continuing to proceed on a 4-percent-per-year reduction across the base of the Department. I would say that 4-percent reduction, Mr. Chairman, is intended to continue through the year 2001.

The net impact of that will be a reduction in staffing from about 113,000 to roughly in the neighborhood of 60,000. This will be a smaller laboratory infrastructure in the Department.

As you know, each of the laboratories is managed directly by each of the services involved, and are rolled in DOD as an overall coordination of this process to eliminate unnecessary duplication and to be able to work programs together. I would say our reduction is characterized by an effort to be doing just that.

Mr. WELDON. Thank you, Dr. Kaminski.

One other line I would like to get into, which I am sure members will have a number of questions on, deals with the TRP Program, which as you know has been the subject of significant controversy.

I have attempted to maintain an open mind on this whole issue. As a matter of fact, yesterday I spoke at a conference in Philadelphia with some people who are involved in the process, as I have done on several occasions. A part of the confusion I think is that the administration initially hailed the program in a different light than the way it is portraying it now.

Up until now, it was being called a defense conversion effort. If you will look at the past, in terms of the way it had been described, it was more an approach that we change industry from defense to civilian technologies. That is not being heralded today.

In your statement you said that if you didn't have TRP, you would have to invent it. I guess my question deals with the authority already in title X, section 2371, which in fact predates TRP, and which over the years has already given that authority.

In fact, the example that you cited today in your testimony, staff tells me was actually not a TRP Program, but was put in there by the Congress itself 2 years ago, and that this particular program would have been developed irregardless of the TRP process.

So, the question is with TRP being a process and not a technology, what does TRP do that you can't accomplish under the existing regulations in section 2371?

Dr. KAMINSKI. Mr. Chairman, I view TRP as really a particular implementation. The idea of dual use technology that I was describing in principal, that has been going on for years. We have, for a long period of time, been looking to leverage our commercial technology and doing it exactly in that way. The particular features in the TRP that are interesting to me are the fact that: First, it is a shared investment. There is a commitment on the part of the commercial partner to make an investment that typically is equal to the investment that the DOD is making.

That not only gives us a bigger wheelbase to operate from, but it is an indication of the commitment of the seriousness of the commercial technology.

The second related piece is a competitive process that is in place to let the best ideas bubble up and to select them using competitive processes rather than targeted processes. Those two, I view, to be advantageous elements of the TRP Program, but certainly one can do dual use without a specific TRP implementation.

Ms. HARMAN. Mr. Chairman, would you yield on that point?

Mr. WELDON. Yes, I will in a moment, but just to followup on that before I yield to the gentlelady from California.

The specific question, is there anything that TRP gives you in the way of authority that you don't already have under section 2371?

Dr. KAMINSKI. I don't believe that there is anything in authority that it provides.

Mr. WELDON. Just the process is what you are talking about.

Dr. KAMINSKI. The process.

Mr. WELDON. I will be happy to yield to the gentlelady.

Ms. HARMAN. First of all, I appreciate your asking that question. I also appreciate the answer from Dr. Kaminski. Some us, as you know, are intensely interested in this; not to preserve the initials TRP, but to preserve the function.

If it is in fact true that the function can be preserved without the initials, then that would be fine with this member, but I want to be absolutely sure that we not only can develop technology, but demonstrate the technology which I thought was a feature of TRP as well and I am not sure is a feature of other ARPA Programs without TRP. I just wanted some clarification on that point.

Mr. WELDON. I thank the gentlelady for that clarification. With that, we will move along to the ranking member, Mr. Spratt.

Mr. SPRATT. Thank you, Mr. Chairman.

Mr. Secretary, thank you very much for very useful testimony. I was reading with one eye and listening with one ear and may

have missed a few things. Let me ask you about a couple of systems which may or may not be topical or controversial this year.

First of all, the Comanche. When we authorized the Comanche some years ago, we did it knowing that there was an alternative choice, incremental improvements to the Apache like—and the AHIP. We decided that we wanted to make a technological leap and would do it provided that we could attain certain unit-cost objectives in the effort.

Are you satisfied that we are going to be able to track the unit-cost objectives that we laid down when we embarked upon the Comanche program?

Dr. KAMINSKI. Mr. Spratt, I have nothing that indicates to me clearly that we won't be able to do that. I think a key piece of the prototype program we have had is in fact to validate our models for manufacturability and for cost. My opinion is that we will be on that base to be able to achieve it.

Mr. SPRATT. What is the program unit-cost objective that you have before you now?

Mr. KAMINSKI. Bob, would you put up the Comanche slide?

We have no reported unit-cost objective at this time, but we certainly have a sense.

Mr. SPRATT. Down in the lower right-hand quadrant, program acquisition unit cost. I am having a hard time understanding that little portion.

Dr. KAMINSKI. That chart indicates we have not started reporting program acquisition unit cost on this system in the Selected Acquisition Report [SAR].

Mr. SPRATT. There is no stated, in concrete, objective at this point for reporting purposes for the program.

Dr. KAMINSKI. I have an estimate. If you would, Mr. Spratt, I will supply that for the record.

[The information referred to follows:]

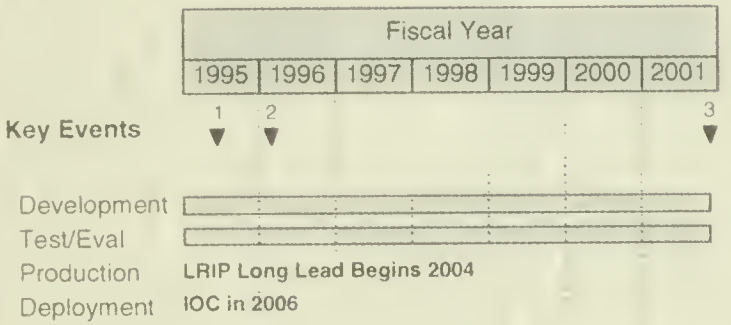
COMANCHE UNIT COST ESTIMATE

The unit flyaway cost is a government estimate of production cost. It is comparable to the contractor's Design to Unit Production Cost estimate. The Army's most recent (in 1993) estimate of unit flyaway cost for 1292 Comanches bought at 120 per year is $10.5M in FY 1988 dollars. The restructured program I approved on March 21, did not include production approval and therefore a unit cost objective is not appropriate at this time.

Program Acquisition Unit Cost (PAUC) includes RDT&E, procurement and military construction (weapons system related) appropriations and is included in the Selected Acquisition Report (SAR) sent to the Congress every year for programs beyond Milestone II. Since Comanche is still in the Demonstration/Validation Phase, and a production decision will be made no earlier than Milestone II, a PAUC estimate is not appropriate at this time and is not included in the SAR. However, the Army calculation for PAUC based on the FY 1995–1999 Future Years Defense Program is $34.7M in then year dollars.

Comanche (RAH-66)

Schedule



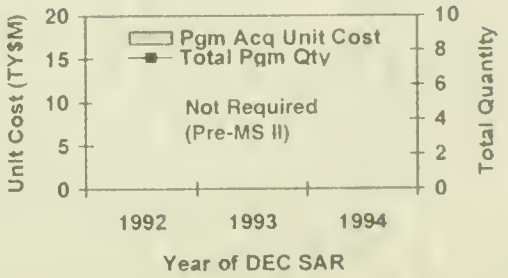
Program Status

Key Event	Date
1. Rollout	05/95
2. First flight	11/95
3. MS II	10/01
4. LRIP (LL)	11/04
5. MS III	07/06
6. IOC	07/06

Budget

	Then-Year $, Millions				
	Prior	FY95	FY96	FYDP	Total
RDT&E	2496				
Procurement	0	0.0	0.0	0.0	780

Unit Cost History



Mr. SPRATT. As for TRP, is it your recommendation, I certainly gathered it from your testimony then, that we stay with the authority we have on the books, a process that we have laid out in addition to the section of authority that the chairman was just reading?

Dr. KAMINSKI. Yes, Mr. Spratt. I see no reason to change that authority. I believe it gives us an effective base to operate from.

Mr. SPRATT. You made some recommendations about the acquisition work force, but didn't dwell on that subject very much. Some years ago when the Packard Commission recommended changes in the procurement system it, by Mr. Packard's own admission, sort of pulled its punches on the acquisition work force, although Mr. Packard was candid in saying that he felt this was one of the Achilles heels; one of the areas that did indeed deserve a lot of attention.

Yet, he thought there was only so much he could do to push the envelop here. He recommended that we follow the model of China Lake and kind of expand the authority for doing personnel programs like that to hire, fire, promote, and compensate with more flexibility than we currently have now under the basic Civil Service system.

Does your administration have plans for sending up any recommendations for personnel changes on that model for the acquisition work force?

Dr. KAMINSKI. We do not have plans to do that across the board for the acquisition work force. We certainly have initiatives along that line in place in various laboratories. I would say, Mr. Spratt, probably the major change we have in place in the Department with respect to our personnel interactions is in introducing this idea of an integrated product team.

We have been doing that very aggressively since I have come into my position. What I mean by that is that our oversight system in the past used to be one that I would describe as hierarchical.

That is, a program manager made a set of recommendations. It went through a PEO review. That went through a service review. Each one of these hierarchical, finally to OSD for a review process. That took a long time.

What we have in place today in this integrated product team is a structure that cuts through it all; with a team from OSD down to the program manager operating in an integrated fashion. What we have seen here, one major program that I just recently reviewed, the Space Based IR Program.

The oversight and review time on that program went from what would typically be 1 year to about 2 months, cutting through the whole process; empowering people to a greater degree, and removing the hierarchy.

Mr. SPRATT. If I could just follow that up because the red light is on. I would just ask one followup question.

As you look at some programs that have been problem programs or failed programs in the recent past, the A–12 is an example; the C–17 with its cost growth is an example.

Do you think if we had a different work force system, different personnel, different reporting in management information systems

in place we would have known sooner, acted sooner, and averted some of these problems?

Dr. KAMINSKI. I think there might have been a positive contribution there. For the two programs that you mentioned, Mr. Spratt, I think there were other issues that were probably bigger issues that led to those problems.

Mr. SPRATT. On the A–12, for example, this is a small anecdotal piece of information. I think it is probably broadly illustrative of a problem. The plant representative in that case, as I recall, had one other job working for Japan Air, repair work in Japan, I think.

He was the eyes and ears of your program management office on the plant floor where you were pushing the envelope with some pretty far-reaching technical requirements. As I listened to the problems of that program unfold, it just occurred to me that I can't blame him, but I think we can blame the services and blame DOD for putting somebody in a job like that who is to be the eyes, the ears, the advanced early warning system of knowing what is happening, of being able to watch sensitive indicators, know what to look for, accumulations of scrap on the plant floor, delays in this particular system develop, and in that particular system develop. We were late knowing it and now we are out of pocket $1.5 billion.

I think a part of the way we make it through the 1990's is by blazing a different path from the path we followed in the 1980's and in the 1970's. We have got to do it better. I am heartened by what you have put up there, but I am wondering just how far we can go unless we come to grips with the quality of personnel we have in the acquisition work force.

Dr. KAMINSKI. I think, Mr. Spratt, that is going to be a very significant issue, maintaining the quality of people. My sense is that for the most part, we have very good people in the acquisition work force today.

What we have is a system that doesn't properly, yet, incentivize the right behavior. The incentives are for the very safe and sure, but very long approach in which we sometimes end up spending billions to save millions in the process. Empowering and motivating that work force, and providing some incentives I think are very key.

Mr. SPRATT. Thank you very much.

Mr. WELDON. Thank you, Mr. Spratt.

As I mentioned earlier, we will go through one round of questioning for Dr. Kaminski, primarily based on the testimony he gave. Then he will do a briefing for us on each of the specific major programs following that first round of questions.

I would yield to Mr. Hastings from Washington for 5 minutes.

Mr. HASTINGS. Dr. Kaminski, I was intrigued by your remarks regarding the mess hall at Parris Island where you contracted out, presumably, with a private vendor to essentially warehouse all of the material they needed, food and so forth.

That is called in the private sector just-in-time delivery. That is where they use that. My question to you is how long a contract, No. 1, did you have to let out to the vendor on that in that particular case? Do you know?

Dr. KAMINSKI. It turns out, Mr. Hastings, there are multiple contracts. It is not just one vendor.

Mr. HASTINGS. Is that right?

Dr. KAMINSKI. A framework has been set up. What we are doing is using our electronic commerce system to be able to put orders into the system electronically. Those that are provided can go direct. There is no one answer to the question. I think the contracts are multiple lengths, but they are typically 1 to 2 years in duration with options.

Mr. HASTINGS. Are you going to try this in other areas, other than just mess? Is Parris Island—is what you are doing down there a test program to be applied in other areas later on?

Dr. KAMINSKI. This started out to be a pilot program. We have in place right now, activities to do this, it is called Prime Vendor Direct, in medical supplies, in clothing, and in some food items. We are continuing to expand the program.

Mr. HASTINGS. When did you start all of this?

Dr. KAMINSKI. I think the foundation here began about 18 months ago.

Mr. HASTINGS. What effect has that had on the personnel? Did you displace any of the personnel?

Dr. KAMINSKI. Yes; we did. We displaced the personnel who were running the warehouse and some of the transportation elements at Parris Island who were transporting food between the warehouse and the mess hall. In fact, that staff was removed. Having eaten in that mess hall and sampling the attitude of people, the sense is that food quality has gone up significantly.

Mr. HASTINGS. They are still the same cooks.

Dr. KAMINSKI. Still the same cooks.

Mr. HASTINGS. That's all I have, Mr. Chairman.

Mr. WELDON. Thank you. The gentleman yields back his time.

The next member is Mr. Taylor from Mississippi, recognized for 5 minutes.

Mr. TAYLOR. Thank you, Mr. Chairman.

I want to thank the Under Secretary for being here. I have only one question. It concerns a memorandum that you put out on February 24 of this year, a 3-point memorandum.

The first 2 points I agree with which is competitive bid procedures for $50 million purchases and above. The second is basically defining that, saying if you can go below that and it is practical, you are in agreement with it. It is the third part that gives me trouble. As we have had in this committee and in other committees over a while, a great deal of testimony about an eroding industrial base.

The third part of that provision says that you need to, in effect, contact any foreign diplomat whose companies have been told that we are not going to buy from them and, in effect, apologize to them.

This committee, you, the President, the Secretary of Defense, we were not elected by those people. We were not appointed by those people. We are certainly not paid by those people. It almost troubles me that we have to go up and apologize to the Swedes, the Germans, whoever, for not buying their products.

I have in my district, and there is a similar plant up in Massachusetts, traditionally fight, I mean, annual fight with the Navy over where we are going to buy our propellers.

It is my understanding that the diplomatic corps has made a tradeoff on foreign sourcing propellers that the average American is certainly not aware of.

When we pass legislation through this Congress that says "made in America" on a regular basis by overwhelming votes, that's what we mean. I would like to hear your side of it. I have a copy of this in front of me if you need to be reminded.

When we are down to one person who would bid on the C–17 and therefore we were pretty much at their mercy whenever they came to us and asked for more money, when we are down to one vendor for tanks, when we are down to two vendors for destroyers, two vendors for submarines, on down the line, I just don't think it makes any sense to kind of have this implied threat to your purchasing agents that you ought to take a good close look at foreign vendors.

Dr. KAMINSKI. Mr. Taylor, my objective in writing that memorandum really comes down to buying the best equipment for our forces at the lowest price overall. As I look at our international cooperative programs, I find in some cases that the United States is now in a unique position in which some of the new programs that we are looking at, we don't have available the resources to put to bear to develop the new programs on our own.

It doesn't make economic sense to do it on our own. So, I am looking to create a broader cooperative framework with our allies to undertake some programs together that we couldn't afford to undertake by ourselves.

It is not only sharing in the development cost, it is using some economies of scale in production and in support, and creating the fabric in which this equipment can interoperate together with the equipment of our allies.

It is to a broader purpose. It is a situation where in some cases, we and our allies together will be needing to look to a common production source for various classes of our goods.

In some cases, that production source for a piece of allied equipment will be in the United States. In some cases, it is better to have that production source in one of participating cooperative allied partners.

Mr. TAYLOR. Dr. Kaminski——

Dr. KAMINSKI. Dr. Kaminski.

Mr. TAYLOR. Please forgive me.

You talk in here a little further on in your testimony about the need for the F–22 because we have foreigners out there selling planes that are as good as an F–15. They have ground-to-air systems that can shoot down an F–15.

Contrast that with what you just said. If we are going to have commonality that any of our allies can sell to any Third World country or any potential foe, why on earth should we spend the money for an advanced plane that everybody in the world is going to have access to?

I mean, it doesn't make sense. We are either going to have a product that is better than everybody else and we are the sole source for it or we do not need to spend the money to be a step ahead of everyone else if everyone else has equal access to the same product.

Dr. KAMINSKI. Mr. Taylor, I wasn't implying that arrangement in which we did a common program with our allies would necessarily cause that program to be available to anyone.

Mr. TAYLOR. It is a fact. Every time we turn around Americans are facing equipment that in some instances that we made and sold or we gave the technology to someone else and they sold it to someone who ends up pointing it back at us.

I think we have to fish or fowl. I, personally, would prefer us to be fish. I, personally, think that we ought to be making products that are available to protect our people and give us a technological edge.

In times of war, I happen to remember the Viet Nam experience where many of those people who helped supply us this time were on the other side last time. It could be that case next time. Where will we turn for weapons then?

Dr. KAMINSKI. Let me respond in two parts. First, with respect to controls of the weapons systems, we have the complete freedom in these agreements to put in place the controls we would use for the United States.

Unfortunately, Mr. Taylor, I think in the new world conditions that are being developed, my comments about the industrial base indicate that in many areas now, the Department of Defense is not at the leading edge of the key technologies that impact us.

For example, our information technology, our telecommunications technology, some of our advanced manufacturing methods are being led by commercial operation; commercial operations in the United States and commercial operations overseas. Those technologies are accessible by us and they are accessible by our adversaries. Each has a path to be able to weaponize and to field those systems.

In this environment, protection by itself doesn't work. The key to fielding the most advanced equipment is to have a better cycle time to be able to capture what is happening in commercial technology, to apply it to the needs of our forces, and to field it.

Mr. TAYLOR. Mr. Chairman, may I have one brief followup?

Mr. WELDON. OK.

Mr. TAYLOR. In the followup hearings after the Persian Gulf war, witness after witness after witness said, it was the money we spent in the 1970's and in the 1980's that kept our casualties low and made the Iraqi casualties unacceptable.

It was our superiority in this weapons system, that weapons system, all the way down the line that helped us do what we did with a minimum of casualties. How can that be so and what you are saying, telling me about sharing development and sharing access to this equipment? How can they be in the same equation? They can't.

The Iraqis had plenty of money to buy anything that was out there. Thank goodness they didn't have the same things we had. If we are going to go and share the information in development with the guy who is our friend today, but could be selling our equipment to a potential foe tomorrow, how do you retain that technological edge? I don't think you can.

Dr. KAMINSKI. I think in some cases the only path to retaining a technological edge in some of our fielded systems is to do it cooperatively.

A new program we are launching in medium extended air defense in cooperation with Germany, France and Italy is a program we would probably not undertake operating alone. We don't have the base, the need for the number of systems to warrant development without doing it in a common way.

Mr. WELDON. The gentleman's time has expired.

The gentleman from New York, Mr. McHugh.

Mr. MCHUGH. Thank you, Mr. Chairman.

Dr. Kaminski, I was going to pursue a question about JSTARS. I was out at the National Training Center last fall and had an opportunity to see Force 21, the digitized battlefield and of course JSTARS' participation in that.

I was curious as to how our current acquisition schedule would fit into the two major regional conflict strategy. We are in a very low production acquisition program with respect to that.

I would still like to ask that question, but I think given Mr. Taylor's questions, as well, and my understanding that we are pursuing this project jointly with our NATO allies as to how it might fit into his concerns as well.

Dr. KAMINSKI. We indeed are pursuing the JSTARS program very aggressively in NATO. Our NATO allies collectively are looking at an advanced ground surveillance system for the alliance. An embryonic program office was formed in the NATO structure just recently to access, in a systematic way, what the best system would be.

Once again, what we are trying to do is take advantage of those things which have been developed. There is a U.S. system developed, the Joint STARS, which will be considered in that activity. There are three foreign systems, two helicopter based systems and a system being worked on in the United Kingdom called ASTOR, which is a little behind where the Joint STARS is today.

It is an indication of the potential for doing things on a broader basis. The Joint STARS that we have today, the very substantial investment that has been placed in that system by the United States, is not something that any other of our allied countries could do alone. Their opportunity would be to do that together with us in an allied fabric or not at all.

Mr. MCHUGH. Do we have a personnel presence at the Brussels office?

Dr. KAMINSKI. Yes, we do. We have had a person in that embryonic program office on a temporary basis, Maj. Mindy Grant from the Air Force, and just arriving this week is Col. Tony Badolato, USAF, who will be there full-time as the U.S. representative to that program office.

Mr. MCHUGH. With respect to the current acquisition line, are there any studies being done by your Department as to the possibility that the current schedule wouldn't meet the probable needs under two major regional conflicts? Do we need more units? Is anyone looking at that?

Dr. KAMINSKI. We do need more JSTARS units. Our plans are to produce 19 with an additional test vehicle. We have in place today

an evaluation looking to see whether we ought to be looking at a bigger force than what we have currently planned.

Mr. MCHUGH. When would you expect that look to be finished?

Dr. KAMINSKI. I don't know when that will be done. I would be happy to provide that for the record. It is underway and it won't be a long time off. I would just estimate on the order of 6 months.

Mr. MCHUGH. I would appreciate that followup. Thank you, Mr. Chairman.

[The information referred to follows:]

JOINT STARS FORCE STRUCTURE

The Department reveiw of the Joint STARS force structure will be completed by October 31, 1995.

Mr. WELDON. Thank you.

The gentleman from Texas, Mr. Geren, is recognized for 5 minutes.

Mr. GEREN. Thank you, Mr. Chairman.

Dr. Kaminski, thank you for your testimony and for your great service.

I guess a variation on the question raised by Mr. Taylor and perhaps to a certain extent taking the opposite side of the argument from him. I am very mindful of the concerns that he has expressed.

I do question whether or not we are going to be able to go it alone and maintain our industrial base. It is hard to say how much is too much and at what point we are going to deprive ourselves of the resources we need to maintain our industrial base.

I guess it is kind of a case-by-case approach. Sometimes you make mistakes that you end up paying for dearly in the future. As far as the issue, regarding the industrial base and attracting the kind of foreign participation that we need, it would seem to me in addition to joint research programs, FMS is also another component of maintaining the industrial base; not just for selling products that we currently have, but also in developing products for international sales.

Could you just comment on your thoughts on if we need to be doing more in the FMS area? Do you feel like the laws that we currently have are adequate to protect our interest, as well as recognize that we do have legitimate industrial base interests in promoting those sales?

If there are some issues that we, as a Congress, ought to consider in the FMS area, should we be doing more to open up opportunities? Are you satisfied with the existing opportunities? How important do you see FMS to maintaining our industrial base?

Dr. KAMINSKI. I see FMS as being an element in our industrial base issues, but not the primary one. I think our basic programs in the department are far more important. I think the overall considerations on foreign military sales ought to be dominated first by national policy issues and interests and secondly by our industrial base issues.

In terms of any adjustments to the program there is only really one that is a current one that I would favorably recommend. That is the recoupment costs associated with amortizing the R&D programs; removing that recoupment will certainly put us in a more favorable posture when foreign military sales are in order.

Mr. GEREN. Which system do you think the recoupment issue would affect most significantly? Are there certain parts of our arsenal that the recoupment is heavier burdened in our effort to market internationally than others?

Dr. KAMINSKI. I can't say that one particular system stands out. As I look across the board, where there are competitive systems being looked at, I can see that it could impact a number of systems. One that would come to mind immediately is the AMRAAM system. It is an air to air missile system for both Air Force and Navy use in which there are a couple of FMS cases active at the moment.

Mr. GEREN. Do you feel like we are sufficiently aggressive with our FMS now, or as aggressive as we can afford to be, that we are not missing some opportunities there that would contribute significantly to our industrial base maintenance?

Dr. KAMINSKI. Yes. I feel we are significantly aggressive. I know I have been involved, personally, in a number of the situations where we have situations that are in a competitive process, simply to be sure that the U.S. story is well heard and the capabilities are well understood by my counterparts, say, among NATO allies.

Mr. GEREN. Do you feel that the cooperation we get out of the State Department is appropriate or do you feel that in some cases that they are not sufficiently mindful of some of DOD's needs? Do you feel tension there?

Dr. KAMINSKI. No. I do not feel tension. I feel the cooperation is good. In fact, in a couple of notable situations in which I personally participated, we have had exceptional support from in-country personnel from the U.S. Ambassadors, for example, who have taken a personal interest in making something happen. So, I would say the support has been very good.

Mr. GEREN. So, other than recoupment, there is no specific changes that you would recommend?

Dr. KAMINSKI. That's correct.

Mr. GEREN. Thank you, Dr. Kaminski. Thank you, Mr. Chairman.

Mr. WELDON. I thank the gentleman.

The gentleman from Indiana, Mr. Hostettler is recognized for 5 minutes.

Mr. HOSTETTLER. Thank you, Mr. Chairman.

Mr. Chairman, before I ask a question of the witness I would just to raise a concern that many of the questions that I have asked previous witnesses before the whole committee, the National Security Committee, have been concerning the idea of coalition forces for fighting and winning two MRC's.

The Bottom-Up Review says that the review from former Chairman Aspin says that we should be able to do it alone if necessary. Now, as a result of a response from Mr. Taylor's inquiry, I now am beginning to understand that we are not only discussing coalition forces for fighting and winning two MRC's, but possibly coalition forces for even development of some of our technology.

That is a concern that I will air at this time. Given this is the first time that I have heard testimony like this, I will not continue. I would like to ask a question of the witness.

Concerning the DOD and commercial R&D expenditures on the graph you showed us, we see in the early 1960's, DOD R&D out-

pacing the commercial. In the past, commercial going much, much higher.

Then we turn at the end of your testimony discussing the F–117 and your comment that many of the technologies were in hand that we used for the F–117 and the success that we see there.

Could you comment on the number of these technologies that were as a result of commercial development alone as opposed to DOD research and development alone? Are most of these from the commercial sector or did we derive most of these as a result of the DOD research and development?

Dr. KAMINSKI. Most of the technologies that went into the F–117 were DOD developed technologies. Probably the notable exceptions that I would indicate was with some of the computer technology associated with both the radar cross section codes and the computational fluid dynamic codes. Those had a strong commercial base,

Some of the on board processors that were used in the F–117 had a commercial base. There certainly was a commonality of interest for commercial uses for the computational fluid dynamic codes. At the time that they were used for the F–117, the DOD was in the lead. That has become more balanced since that time. The preponderance was DOD developed; no doubt about that.

Mr. HOSTETTLER. Isn't that because of what many of these technologies are used for and that is for fighting and winning wars? Would you not agree that while there are some good that can be derived from the commercial technology R&D, that many of the things that we do as far as armed services and national security have to come out of a significant commitment to R&D funding from the Department of Defense, as we have seen in the success of the F–117?

Dr. KAMINSKI. Many of the things do. I think though the projection that was giving talks about the growing leverage for the Department of Defense applications of elements such as advanced information technology, some of the advanced sensor technology, the telecommunications and related communications technologies, there is strong leverage for DOD use.

The leading element is commercial. What the Department of Defense has to do here is to be a smart customer to be able to see what is being developed there. In some cases, we will need to put hooks into that technology; just add some special features which aren't of commercial value, which would be critical for our own use.

Our dollars will have to do that. Plus, we will have to spend our dollars to do the system integration work to capture those technologies, to embed them in our systems to militarize them and make them work. There is no way we can avoid that integration. That has to be a DOD skill base that requires people to do that. It requires a long-term investment program to do that.

Mr. HOSTETTLER. Would this not be more in the area of applied research and development as opposed to basic?

Dr. KAMINSKI. Exactly; as applies to basic.

Mr. HOSTETTLER. The basic is where we may be spending more money as far as applying commercially derived technology to defense technology necessities as opposed to spending as much money in the area of basic research as it applies to defense technology.

We are essentially taking technology from the private sector and applying it to defense, as opposed to doing basic research for defense concerns and then taking them through the development stage into new weapons systems.

Dr. KAMINSKI. Yes. We are actually doing some of both; if I could comment. For example, on the stealth technology that goes into the F–117 or follow-on aircraft. There is almost no commercial application with the stealth technology.

That is something that the department is going to have to look after in advance. As I was saying earlier, some of the mathematical codes, some of the critical computer processing systems that run those codes, they now do have commercial base.

I think we are going to continue to see some mix of pieces here in the future with the need for some underlying DOD basic research in technologies that are unique to DOD, and then the ability to exploit and apply, as you said, what is happening in the commercial sector.

Mr. HOSTETTLER. Thank you very much. Thank you, Mr. Chairman.

Mr. WELDON. I thank the gentleman and recognize at this time the gentleman from Virginia and chairman of the Readiness Subcommittee, Mr. Bateman, for 5 minutes.

Mr. BATEMAN. Thank you very much, Mr. Chairman.

Welcome, Dr. Kaminski. We are very pleased to have your testimony this morning. I have several things I would like to throw out more for your comment than direct and specific questions.

One of them relates to what has come to my attention as a potential for an enormous cost saver in the maintenance of military aircraft. What is involved is a robotic highly new technology development through NASA for detecting corrosion and cracks in the air frames of aging aircraft of which we have a very large number.

Present methodology dictates that you have got to remove all of the paint from the aircraft in order to inspect it. Then, if you don't find anything, then you have got to paint it again anyway. If you do find something, then you have all of the problems of the maintenance.

The NASA technology, which is at this point able I think to be demonstrated, would save literally billions of dollars just in the military aircraft inventory. It has all of that same potential for the civilian airline industry which, given its economic straights, is not going to be in a position to go out and demonstrate this technology, but which would benefit from it. Our civil aviation would be enormously advantaged if they did.

I don't know whether this has come to your attention, personally, but I would certainly suggest that it is a very fertile area for inquiry. If you see fit to do that, I would love to hear your reaction to whether or not this does seem to be something that we ought to put a modest amount of money into demonstrating the technology.

Dr. KAMINSKI. Excuse me, Mr. Bateman, if I might comment on that. One, I would underscore the need for attention to corrosion and related problems. The Air Force Science Advisory Board recently finished a study on aging aircraft. That, indeed, is a real problem.

It is something I think would be of great interest to the Department and to commercial aviation. Unfortunately, I cannot comment on the specific technology. I am not familiar with it. I would be happy to look at it and respond for the record.

Mr. BATEMAN. I would be glad to furnish more specific data as to any sources that I could steer you to in NASA who had developed the technology.

[The information referred to follows:]

REVIEW OF NASA'S PROCESS USED FOR DETECTING CORROSION/CRACKS

Several techniques are being developed by NASA Langley Research Center (LaRC) for the detection and quantification of corrosion in aircraft structures. The techniques have been developed as part of the NASA Airframe Structural Integrity Program. The techniques focus on the detection of subsurface corrosion in thin laminated structures.

The NASA Airframe Structural Integrity Program was initiated in October 1990, with the objective of developing improved technology to support the safe and economical operation of commercial aircraft. The program has three principle focuses, Structural Mechanics, Fracture Mechanics, and Quantitative Nondestructive Evaluation (NDE). The Quantitative Nondestructive Evaluation Program has concentrated on the development of area inspection techniques for the detection of cracks, disbonds, and corrosion in the fuselage with particular emphasis on the lap joints and tear straps. These techniques offer economical inspections by reducing the person hours required for performing the inspection without reducing its safety or reliability. Four techniques are being developed for the detection of corrosion in the airframes. They are based on eddy current, ultrasonic, thermal, and x-ray stimuli of the structure.

The eddy current technique being developed is based on a new probe design which has an output which is easily interpreted and has a reduced sensitivity to lift off error. It has the goal of being able to determine the material loss in first and second layers. The ultrasonic system is a pulse echo based technique which accurately quantifies the material loss in the first layer of the structure. It has been integrated into a portable scanner to enable imaging of the corrosion area. The thermal technique is a large area technique capable of locating regions with 10% or more material loss. Finally, the x-ray system is based on an x-ray concept called "reverse geometry x-rays" which enables the detection throughout the full thickness of the structure.

This NASA program in NDE is fully coordinated with the NDE efforts in the Air Force Wright Laboratory's Materials Directorate, the Air Force Office of Scientific Research (AFOSR) and the Federal Aviation Administration's (FAA) National Aging Aircraft Research Program. There is a formal Memorandum of Understanding between the Wright Laboratory and the NASA Langley Research Center regarding all areas related to aging aircraft, of which NDE is one of the featured topics. There have been numerous jointly sponsored technical meetings between the three agencies to review their technical work, with another scheduled for 24–25 April at NASA LaRC. The Air Force Materiel Command, in conjunction with the Wright Laboratory, AFOSR, and the Air Logistics Centers, has fostered working groups in the area of aging aircraft. NASA and the FAA have both participated actively when these efforts have been reviewed. The next major aging aircraft review is being planned for Wright Patterson Air Force Base in the Fall of 1995.

Mr. BATEMAN. The next question relates to strictly a procurement methodology and based upon the experience of a year, year-and-a-half ago. The Navy was purporting to run a competitive bid process for the construction of sea lift vessels under a cost plus an incentive fixed price contract arrangement.

In the course of their request for proposals, they got back bids from several potential shipbuilders. In the administration of the program, the Navy determined that one of the builder's bid was not realistic and increased the cost assigned above the contract price proposed by $300 million, even though the shipbuilder in question, based upon work they were doing for the Navy or for the Government, had billions of dollars in money from other programs.

So, that if in fact they didn't deliver at the agreed price, the Government had what it needs to protect itself. Yet, they added $300 million to the low bid. Thereby, costing the taxpayers $300 million in what would seem to me to be excessive cost. This seems to me to be a very poor way to run a railroad, a procurement railroad, or a system. I think this needs to be looked at.

Next, a generic observation. Constantly, in the last several years, I have been reminded, we all have, that as we enter an era of lower unit production, it is driving the price per unit very, very high. One of the things that some people talk about as a way to better manage that phenomenon, some of which is inescapable, would be to move to multiyear production or procurement rather, as opposed to everything being done on a year-by-year-by-year basis. So that whoever is selected to produce the units, at least has a steady rate of production that they can anticipate and can affect the economies that come from it from which we, as taxpayers, can benefit.

Any comments you might have on that initiative would be appreciated.

Dr. KAMINSKI. Mr. Bateman, my sense is that multiyear procurement is a very good idea to reduce costs and allow people to plan more sensibly. It does require a discipline that in fact we maintain the program's stability for that period of time. So, we have to have some confidence going into it that we will be able to sustain that rate of production.

In general, I favor the use of multiyear procurement. We could probably be using it a little more than we are today to reduce costs and have a better sustained base.

Mr. BATEMAN. Mr. Chairman, if I might follow up.

You make reference to a discipline and a degree of assurance that we would maintain a schedule. What I would like to have from you and your associates in the Department of Defense is what kinds of things do we need to do in order to instill that degree of discipline so we can go ahead and get this done?

If it is a good idea, we need to implement the good idea. What would beinordinantly helpful to us is how do we instill a degree of discipline that allows us to go to multiprocurement with confidence?

Dr. KAMINSKI. I agree, sir.

[The information referred to follows:]

MULTIYEAR PROCUREMENT

MYP is an established procurement method that has a proven record of generating savings in defense acquisition. As you note, the real challenge with building a successful multi-year procurement (MYP) is instilling discipline in all of the Department's major management processes—requirements determination, acquisition, and resource allocation—that fosters an environment conducive to program stability. How can we create such an environment? An important step is to do our best to ensure that we do not start more acquisition programs than we can reasonably afford on a timely schedule. This will require better long-range planning and more explicit prioritization of investment efforts. The Department must be willing to terminate lower-priority programs to keep high-priority efforts on track. Historically, efforts such as MYP have suffered from a tension between stability and flexibility. On the one hand, stability is desirable because it keeps costs down and allows people to plan mores sensibly. On the other hand, flexibility is something valued by both Congress and the Department because we are often operating in an environment of significant uncertainty, where major contingencies can arise with little warning.

Mr. WELDON. The gentlelady from California, and former chair of this committee, Mrs. Schroeder.

Mrs. SCHROEDER. Thank you very much, Mr. Chairman.

Thank you, Mr. Under Secretary. I wanted to thank you again for mentioning TRP and how it was different than every other thing that ARPA did because it is a process. The process we found to be one that was the most difficult to "porkify."

Once it was in here, once it went through that competitive bidding, that's what determined it; what people in the area thought would be most helpful rather than what somebody thought was their pet project or would like to have in their district.

Have you found any way that TRP could be turned into pork?

Dr. KAMINSKI. With this competitive process in place, I think it is very difficult, Mrs. Schroeder.

Mrs. SCHROEDER. Well, I think this is such an important thing to be doing with our industrial base that finding those kinds of processes and then trying to protect that above other things that could be easily earmarked I think is very, very important.

Let me ask another question on acquisition that troubles me a lot. A lot of industries that you are never going to buy stuff off the production line because we are the only one buying them, like nuclear submarines or whatever, a lot of those are convincing this body that we should continue procuring on the basis that we keep that expertise of the people on their line.

Yet, I remember a couple of years ago right after we brought into that argument, the manufacturers of *Seawolf* let off an awful lot of the work force, but retained all of the CEO's.

When you deal in those types of acquisition issues which are a little bit different than the things that you are trying to get competitive pricing on, what kind of leverage do you have for the management saying, we are doing this not necessarily because we need one of these, fill in the blank, but we are trying to keep this work force alive as a bridge to the next generation.

Then when they turn around and lay the work force off anyway, what do you do? Is there any way that you can deal with that in acquisition reform?

Dr. KAMINSKI. We have some means to deal with that. In most situations when a work force is being kept in place it is a bridge to a follow design or another capability. In that case, being competitive for a follow-on base is a key.

In some situations though where we are just trying to keep the technical capability in place, what you can do is tailor the work. That is, contract for those technical capabilities specifically that you need to have in place to be able to control, to some degree, the issues that you mentioned, Mrs. Schroeder.

It isn't perfect, but it is a means to get at the more crucial pieces of the technical capability you are trying to keep in place.

Mrs. SCHROEDER. I guess my frustration is the one thing you are not trying to keep in place are the CEO's. Yet, they seem to be able to protect themselves the best in that situation. That is very troubling.

Let me ask another question about the FFRDCs. I know you were talking about the labs earlier on, but there is this infrastruc-

ture of FFRDCs that are out there also. I guess I have several questions.

Have you looked at competing FFRDC contracts versus renegotiating them? What is your justification or what justification does the department have for the incredibly high compensation that some of the people in these FFRDCs get? What is so very special about them that it is different from the private sector, from the DOD labs, the DOE labs? It looks like a very heavy infrastructure I guess is what I'm trying to say.

Dr. KAMINSKI. Let me comment first on the compensation issue. We have two efforts underway today; a compensation review by a well known compensation analytical organization, which is due to report to the Department very soon on compensation for FFRDC personnel.

Preliminary indications that I have from that review indicates that the compensation patterns are probably not excessive. They are in line with industry standards. I would like to defer and comment more precisely on that when that report is available.

We have a second effort looking at this on the Defense Science Board.

The other question that you asked about had to do with competition for the FFRDCs. I think that some approach to competition could be undertaken if it were on a sufficiently long time scale.

The issue with our FFRDCs is one in which the support that the Department is needing is government-like in some nature. That is, we may be sharing critical proprietary information with an FFRDC.

We are looking for a long-term relationship where stability of staff is very important because what we are doing is buying intellectual property very often to do something along the lines of assessing alternative systems that the department is considering looking at, or doing the integration job that we talked about earlier; putting together several pieces of technology, some of which might be proprietary.

So, we are looking for a relationship that can protect critical or proprietary data, has the skill required in the work force that it may be hard for us to get in Government service, and has a long-term relationship to keep staff in place.

Under those kinds of constraints there probably are things we could do to conduct competition on a longer-term basis; say, 5 years or longer periods. We are having a fundamental relook at our whole FFRDC approach.

As I mentioned, the Defense Science Board Task Force that has been underway now for several months is just about to report out. Plus, we have some internal activities underway in the Department to sort of look from square zero what it is we are doing with FFRDC's and how best to apply it.

Mrs. SCHROEDER. Is there one thing in a nutshell you could say that makes these unique from Government labs?

Dr. KAMINSKI. Yes. There may be two things that I would say that differ from Government labs. One is the ability to get certain technical skills or capabilities that are hard to attract to Government service.

Mrs. SCHROEDER. Because of pay?

Dr. KAMINSKI. Because of pay and because of the overall environment. The second issue is sometimes flexibility in personnel policies.

Mrs. SCHROEDER. I will be anxious to see what the reports say. Thank you very much.

[The information referred to follows:]

FFRDC EXECUTIVE LEVEL COMPENSATION

The DSB Task Force on the "Role of FFRDCs in the DOD Mission" assessed the issues concerning compensation levels for FFRDC management and trustees. The DSB reported out that the Congressionally mandated salary constraints, which are unique to FFRDCs, were inappropriate and will lead to a significant degradation in the competence and quality of the individuals and the organizations if left in place. The Hay Group Study was sponsored by the Department to provide an independent study of the reasonableness and competitiveness of the compensation and benefits paid to FFRDC executives. The study found that FFRDC executive level salaries were both reasonable and competitive in the markets for which they compete for people. The DOD Inspector General, at the request of Congress, also performed a review of FFRDC executive compensation and found that the salaries of FFRDC Presidents and senior executives were generally in-line with salaries at for-profit private industry companies.

Mr. WELDON. I thank the gentlelady from Colorado. I apologize for labeling her from California.

I will yield to the gentlelady from California for 5 minutes, Ms. Harman.

Ms. HARMAN. Thank you, Mr. Chairman, and welcome Dr. Kaminski.

I was impressed with your testimony. I am extremely interested as you know in all of these issues. Let me just make one comment on the FFRDCs. I will certainly look forward to the recommendations of the Defense Science Board and hope that you will share them with this committee as soon as you have them.

Dr. KAMINSKI. I will do that.

Ms. HARMAN. Moving on to procurement reform. It is my view that this administration, this DOD Administration, will be remembered most for what it contributed to procurement reform. I know this is a pet project of Secretary Perry's. He has talked about it numerous times here. I am delighted to hear about the steps that you are taking to implement it.

My question is this. We passed legislation last year, which I know makes some major strides, and you have I gather implemented regulations aside from the legislation to make some additional strides.

What else needs to be done in terms of legislative action or oversight by the Congress of this subject? I think if we are serious about spending scarce dollars wisely, there is no place we could pay more attention than this.

Dr. KAMINSKI. Ms. Harman, there are some more legislative things that I believe can be done. We have in a systematic way put together a whole package to come forward in the Department. That has been submitted to OMB. I think it is soon to be submitted.

I can't tell you the exact status of it today. It is a whole set of supplementary provisions; things that we think would help us to take further steps. Indeed, I agree completely, if there is an element this team would like to be remembered for is to have made lasting changes to our acquisition system.

Ms. HARMAN. I, again, would ask for prompt notification as soon as everything is put together. Mr. Chairman, I am not sure where the jurisdiction is in the committee on this subject, but I would urge this subcommittee to give it keen attention and for us to participate actively in whatever goes on in the full committee on this subject of procurement reform.

Mr. WELDON. That has certainly been noted. I would think that we do have joint jurisdiction in various areas of the gentlelady's concerns and a pleasure to work with her in that regard.

Ms. HARMAN. I appreciate that. I see my green light has gone off and on. I will take another 10 seconds to say this.

As you know, Dr. Kaminski, and you do too, Mr. Chairman, my district is the aerospace center of the universe. I have an active Aerospace Advisory Committee there which has recommended that the next phase of regulations or implementing efforts under procurement reform are a very high priority for them.

I make this point because the industry wants the procurement reform; knows that everyone wins from procurement reform. The Defense Department saves money. Industry learns to be more competitive. This is a big part, as far as I am concerned, Mr. Chairman I am sure you will agree, of what we need to do to save the industrial base.

I just urge in the strongest possible terms that this be a very high priority, continue to be a very high priority for you, the defense department, and for this committee. Thank you.

Mr. WELDON. I thank the gentlelady and would remind the Members that just arrived that we are going through a first round of questioning for Dr. Kaminski on the general, broad programmatic issues affecting R&D.

Then we will go to a specific briefing following this round on large programs. If you have specific questions for a specific program, if you would hold those, we would appreciate it.

With that, we yield 5 minutes to the gentleman from Tennessee, Mr. Tanner.

Mr. TANNER. Thank you, Mr. Chairman.

I think most of the broad policy questions that I had have been covered by others. I have three questions about some more specific matters. Should I wait to pose those?

Mr. WELDON. If the gentleman would yield.

Mr. TANNER. Yes.

Mr. WELDON. What I had planned to do when we go through the specific programmatic areas, if it is OK with you, Dr. Kaminski, I would let the members kind of interact as we go through and not have such a formal questioning process so that they can ask what questions they have on each specific program as we go through.

Mr. TANNER. I will reserve my time.

Mr. WELDON. The gentleman reserves the balance of his time.

The gentleman from Rhode Island is not here. The gentleman from Florida, Mr. Scarborough is recognized.

Mr. SCARBOROUGH. I have no questions.

Mr. WELDON. The gentleman has no questions.

The gentleman from California, Mr. Dornan, is recognized.

Mr. DORNAN. I will hold my questions. Dr. Kaminski, it is good to have you with us today. My focus today is the Comanche which we fully support, so I will hold my question.

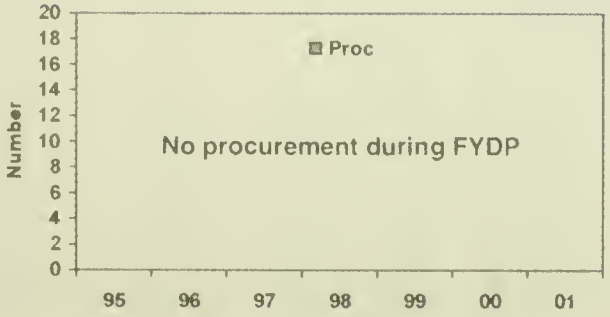
Mr. WELDON. I thank the gentleman.

With that, we will move on to allow you to continue the briefing in terms of specific program areas. For this part of the briefing I will assume you will be joined by Dr. Anita Jones and also by Dr. George Schneiter. Please continue.

Dr. KAMINSKI. Thank you, Mr. Chairman.

Comanche (RAH-66)

Quantities



Objectives

Development

- Designed for Night/Adverse Weather
- 2 Level Maintenance
- Self Deployable

Operational

- Intended to Replace OH-58 and AH-1 in Armed Reconnaissance Role
- Increases Cruising Speed from 113 & 152 knots to 165 knots
- Increases Self Deployment Range from 220 and 426 nm to 1262 nm
- 50% Increase in Target Acquisition Range

If you will, I will start with the Comanche. In December 1994, the department decided to restructure the Comanche program, as you know, and to defer production. I have been involved with the Army acquisition community since that decision. The Army has proposed to me a program that modifies the structure of Comanche and provides two prototype vehicles, followed by six additional early operational aircraft for user evaluation.

These six early operational aircraft will not be fully weaponized aircraft, but they will be fully equipped with a reconnaissance package required for Comanche. This idea is consistent with the advanced concept technology demonstration idea that I described earlier in terms of getting these six systems into the hands of operational users for operation evaluation before we proceed with the program.

These six aircraft will have the forward looking infrared device, advance target detection equipment, the low observable technology fundamental to Apache, all of which are critical to the accomplishment of Comanche's primary reconnaissance mission.

I would note probably that the most significant thing about the restructuring of the program, going back to our earlier decision, is that the program was not killed. We still see significant promise for this technology. It is a very high priority for the Army.

It is a fully integrated system with high survivability features. I view this as a key element of the eyes, not just for the Army, but for the joint battlefield of the future.

Mr. WELDON. If the members have questions as we go through the program, just feel free to raise the question as we go along, rather than being recognized formally. Mr. Dornan, do you have any questions on the Comanche?

Mr. DORNAN. Yes. Dr. Kaminski, we spoke about the whole Comanche program on the phone a few weeks back. You were very supportive. You referred to it, taking the words out of my mouth, the quarterback of the battlefield, the eyes and ears of every division commander on the battlefield.

I think as we are briefed in this room in closed session, and those of us that are up in the Intelligence Committee, about all of the potential areas of danger, the key word that comes to mind which always did during the whole almost half century of the very hot and very bloody cold war, because I always put Korea with 33,629 dead Americans in combat; Viet Nam, 47,000-plus dead Americans; all of the pilots lost around the world; all the young men killed at the DMZ in Korea and CIA agents shot to death in alleys in Eastern Europe. We never did any of that to the Russians.

To my knowledge, we never shot down a Russian airplane in cold blood during the whole cold war. All of that very bloody and very hot war, the key battle cry for those of us who were strong on defense was not to fight them, but to deter them.

I think a future battlefield conflict with a lot of dead young American men and now young American women can be averted if the potential enemy has this feeling that we are so far ahead of them technologically we are into science fiction as far as they are concerned. This is one of those quantum leaps forward. If they don't understand the facts which the Saddam Husseins of the world never do, the Hafiz al-Asad do.

Other than slaughtering 10,000 of his own people in the village of Hama, he is a blood thirsty dictator, but he is smart. We have avoided many conflicts with him because he understands the order of battle.

Someone of diminished intelligent quotient like Saddam Hussein, he will move against the advice of every one of his military commanders. Then, when we have to use some technologically advanced marvel like this recon attack helicopter, the battle ends so much more quickly and so many lives are saved.

The bottom line, as a question, I cannot conceive of us dragging our feet on this program too much longer and getting in a conflict, 5 or 10 years from now, when every Cobra gun ship and every Apache A-64 gun ship is 5 to 10 years older, I just cannot conceive of us being in a battle without this marvelous piece of equipment for the division commanders to use.

When I look at all of the systems we are going to be discussing today, they were all started during different regimes at the Pentagon. One of the things I like about our colleague and friend from 10 years in the House, Dick Cheney, is he never took credit for fighting the war with anything he did in the gulf. He said, this is all Cap Weinberger's doing. We won this war with everything that happened under the Weinberger and Reagan years.

Also, Jimmy Carter's administration, was the administration, and you were around then in very key positions, that launched stealth technology. The F-117's were the first in, in mid-January 1991 when the air war started over the gulf area.

The B-2, I think, is going to be a major deterrent if we can get to intelligent dictators like Asad and let them know this thing can be over your battle area and it can accomplish the job of 30 F-111's or 15 B-2's, we can be there at night. You won't even know we have come and gone and we will destroy your tank divisions before they move across the border or before they have gotten into someone else's territory.

My question is, how fast a track do you see this on? Even though you are in the science end of all of this, I would like to ask about an IOC, an initial operating capability under this Pentagon, under Clinton?

I told you on the phone that I don't think we will ever see again a situation where we have a Perry, a Deutch, and a Kaminski, people with so much unmasked scientific knowledge, ever again in that situation. We are already losing Deutch to an equally key position at CIA.

When can we see this marvelous piece of peacekeeping deterrent technology and war winning technology in the divisions of the United States?

Dr. KAMINSKI. Mr. Dornan, that will be after the turn of the century. What I am looking to do here is to get these six prototype aircraft out into the hands of our operational users to wring them out in the recce mode.

That begins to happen about the year 2000 for us to do this assessment. As you know, we don't have a procurement funding in place for the program at this point. So the IOC still is uncertain. It is still well after the turn of the century.

Mr. DORNAN. Putting six out into a functional platoon, working them out in the field and, could I ask you for this analysis? It is a little bit optimistic, but don't you, with your training and your close knowledge of this program, don't you believe it is going to go through its field evaluation with flying colors? That's my gut feeling. What is yours, sir?

Dr. KAMINSKI. That's my expectation or I wouldn't be doing it, Mr. Dornan.

Mr. DORNAN. Right. So, it is on a fast track as far as getting it out into a combat platoon, squadron operation and watching it perform the way everybody believe it will, then next term, next presidential term, whomever is there, that's when the IOC and production dates will start to come down.

Dr. KAMINSKI. That's the time a production program could be in place. I would say that we still have some uncertainty about what is the appropriate force structure for Comanche? How will it fit and play with our UAV systems? Those are some of the analysis we want to undertake.

You don't want to do all of this on paper either. We want to see these systems in the field working by our soldiers and maintaining the equipment.

Mr. WELDON. I thank the gentleman.

Mr. DORNAN. Mr. Chairman, I have a commentary in the current issue of Defense News, through April 2d issue. Obviously, I like it because I wrote it. I would like to submit it for the record.

Mr. WELDON. Without objection.

[The information referred to follows:]

COMMENTARY

INSIDE VIEW

Protect Comanche's Future

Advanced Copter Holds Key to Battlefield Control

By REP. ROBERT DORNAN

In the late summer of 1994, as most congressional committees were putting the finishing touches on their respective versions of the 1995 defense budget, John Deutch, deputy secretary of defense, sent a memo to all of the military services directing each to examine nine new weapon programs for possible termination.

Among the programs listed was the Army's new armed reconnaissance helicopter, the RAH-66 Comanche, which is scheduled for its first flight later this year.

After intense lobbying by both the services and congressional supporters of these programs, the Comanche emerged on Dec. 9 as a program slated for termination.

Such a short-sighted budget cutting measure promises dire consequences not only for future Army aviators, but for all future battlefield commanders.

While arguments against canceling the RAH-66 put forth by industry and local government officials that concentrate on job loss and the helicopter industrial base are compelling, there are much more important reasons to rescue the aircraft from cancellation.

First, the Comanche is scheduled to replace existing Army scout aircraft that are 30 years old both in design and capability, including the OH-58A aircraft, one of which was shot down over North Korea earlier this year.

These Vietnam-era aircraft are becoming increasingly difficult and expensive to maintain, and simply will not get the job done on the battlefield for much longer.

In addition, these OH-58 helicopters were never properly equipped for the mission they are required to perform: armed reconnaissance.

The OH-58A and C Kiowa aircraft are woefully underpowered for operations in the high winds of the desert or hot temperatures of the tropics, carry absolutely no armaments; and possess no advanced optical instruments with which to find the enemy at long range.

The Comanche was specifically designed to address all these deficiencies. It has powerful new engines for operation in the most demanding environmental conditions; heavy weapons, including both guns and missiles for engaging land, sea and air targets, and advanced optics to locate enemy and friendly forces at long range, day or night.

As we continue to draw down our force structure, especially forward-based units overseas, we need to emphasize weapon systems that enable our military forces to project combat power quickly and far.

Our experience in the Middle East clearly illustrates this problem. Once Saddam Hussein's armored divisions began moving toward Kuwait, our ability to respond quickly with our own armor forces, even those on board prepositioned ships, was very limited.

However, the RAH-66, which can carry the Hellfire antiarmor missile, is easily deployable into such a region for immediate combat operations.

The Comanche can be transported by all Air Force transport aircraft and is ready to fight within 30 minutes of landing. An entire battalion of Comanche helicopters could have been deployed to the Middle East on just 10 C-5 aircraft sorties, as compared to a battalion of M1 tanks that would have required six times as much airlift capacity.

During a time of drastically declining defense resources, when we may not be able to afford the lift necessary to accomplish quickly a Desert Storm II, the easily deployable Comanche represents another alternative to help solve our continuing lack of strategic lift assets.

Once deployed, the speed and range of the RAH-66 also would allow these aircraft to perform deep strikes, as well as antiarmor missions, against Saddam's Republican Guard units.

Finally, and perhaps most importantly, the RAH-66 will be much more than a new helicopter.

The Comanche promises to be the central element on the battlefield, with its ability to acquire and process tactical battlefield information through advanced digital electronic capabilities. The RAH-66 will enable future commanders to control the battlefield as never before.

The Comanche will be able to coordinate air attacks by Air Force and Navy jets. It will be able to locate, target and destroy high-value enemy targets such as air defense weapons and tactical ballistic missiles.

In addition, the Comanche will be able to receive and disseminate intelligence information, including satellite data, and coordinate the fire and maneuver of other Army assets, including tanks, artillery and attack helicopters.

No other single existing or projected system will be able to coordinate a battle the way Comanche can. Such capability will allow future commanders to win quickly and decisively, even if outnumbered, with minimal casualties.

Employment and industrial arguments aside, the most compelling arguments for continuing the Comanche program are modernizing our obsolete scout helicopter force and improving our ability to rapidly deploy credible combat power.

To cancel Comanche is to concede the initiative on the future battlefield to the enemy. To rescue the RAH-66 from termination is to realize the potential for dominating warfare in the 21st century.

Rep. Robert Dornan, R-Calif., serves on the House National Security Committee.

U.S. Army Awaits OK on Comanche Demonstrators

Service Views Reconnaissance As Top Shortfall

By JASON GLASHOW
Defense News Staff Writer

WASHINGTON — A high-level Pentagon board will decide this week on a U.S. Army plan to build six demonstrator RAH-66 Comanche helicopters in addition to the two prototypes currently in development.

The Defense Acquisition Board (DAB) is due to decide on the viability of the eight-Comanche plan, which could have a significant impact on the service's reconnaissance capabilities.

The Pentagon's Conventional Systems Committee on March 9 approved the initiative, giving hope to service officials that the DAB will look favorably upon the plan.

The DAB is chaired by the undersecretary of defense for acquisition and technology and is responsible for approving further development of major programs.

Army officials want to boost Comanche development by procuring eight unarmed Comanches with funds already allocated to build two fully outfitted aircraft.

Comanche funding was slashed last December from $4.2 billion to $2.2 billion over the next six years as part of a Pentagon-wide cost-cutting initiative led by John Deutch, deputy defense secretary. Under the Army plan the eight Comanches would get weapon packages in 2002.

Comanche remains a top priority for Army officials, who deem reconnaissance aircraft the service's greatest potential operational shortfall over the next decade.

Also, the Comanche's ability to provide information to systems and commanders in the field is considered a key cog in the effort to digitize the battlefield.

"We want the scout to know everything the best he can," Col. Jan Callen, chief of the aviation division for the deputy chief of staff for operations and plans, said in a Feb. 22 interview.

"We want to inform him about the friendly situation, enemy situation — before he even departs for the mission — then you want to have the capability to update him while the mission is being performed."

The Comanche will be equipped with a suite of sensors and target acquisition devices, allowing the soldier to collect data from the battlefield and digitally send that information back to the ground commander.

In the interim, the OH-58D Kiowa Warrior remains the Army's bridge to Comanche.

Contractor Bell Helicopter Textron, Fort Worth, Texas, will produce 16 Kiowa Warriors this year, and arm 36 systems with weapons in a concurrent retrofit effort.

Although the Army requirement for Kiowa Warriors is 507, service officials only plan to procure 382. Col. Edwin Goosen, project manager for the Kiowa Warrior, said that number likely will not be raised over the out-year budget plan.

New Kiowa production and retrofitting will be completed by February 1998.

"We will make sure we can fill the mission until the Comanche comes on board, but not to the point of making a huge investment," Goosen said in an interview March 10, noting that he would try to take advantage of software and hardware advances whenever possible.

To meet the Army's reconnaissance requirements, the Kiowa will include the latest software upgrades and digital technology, such as a new precision navigation device using global positioning.

Other advances include combat identification devices, an improved data modem and radio, and a video downlink.

Little can be done to upgrade the speed, range, and visibility of the aircraft to radar, he said.

Still, Goosen said the Army plans to look at emerging technologies such as the 2nd Generation Forward Looking Infrared (FLIR), although no decision has been made on whether to add the detection system to the aircraft.

According to Russ Rumney, Bell's manager for Army helicopter requirements, the contractor also has found new ways to expand aircraft capabilities by reducing weight and replacing existing systems with lightweight technologies.

"We have done some work that shows there are some near-term options to reduce weight. That coupled with the longer term improvements, should eliminate the perception" that the Kiowa Warrior cannot be grown beyond its current configuration, Rumney said.

The U.S. Army will continue to upgrade the OH-58D Kiowa Warrior helicopter (above) to fulfill its primary aircraft

reconnaissance role until the RAH-66 Comanche comes on line. The service will find out this week if its plan to build six demonstrator Comanches is approved.

> *"We want to inform [the scout] about the friendly situation, enemy situation — before he even departs for the mission."*
>
> **Col. Jan Callen**
> **Chief, aviation division, operations and plans**

Mr. WELDON. Does the gentleman from Florida, Mr. Scarborough, have a question on the Comanche?

Mr. SCARBOROUGH. Yes, I do. In a prior full committee hearing earlier this session the Army was asked what programs it would advance in fiscal year 1996 if its additional funding was there.

The Army did not include the Comanche as one of the programs. My question is, it has been touted as really the Army's No. 1 priority. My question is, what is your view of the support for the program inside the OSD? Do you think the Comanche is going to have to fight a battle each year, year in and year out, as it had to fight in 1994?

Dr. KAMINSKI. I think the support for the program I have just described, the fielding six units for operation evaluation is high in the Army and it is high in OSD. I don't think we can really make a commitment to the program that follows on until doing that work, completing that evaluation.

In this situation of difficult affordability, certainly there are going to be issues raised on this program in the future. I couldn't say with confidence that those won't be raised in future years as we look for the most affordable component.

Mr. SCHNEITER. If I may, our records indicate that on February 22, the Secretary of the Army and the Chief of Staff did state that Comanche was their No. 1 priority. So, we may have a difference of record.

Mr. SCARBOROUGH. I did know that the Army has stated in the past that it was their No. 1 priority. I didn't hear that in a full committee meeting earlier. That's why I raised the question.

Do any of you see the Comanche in the future moving beyond the role that people are looking to? Do you see it moving past a limited Army role going to other services?

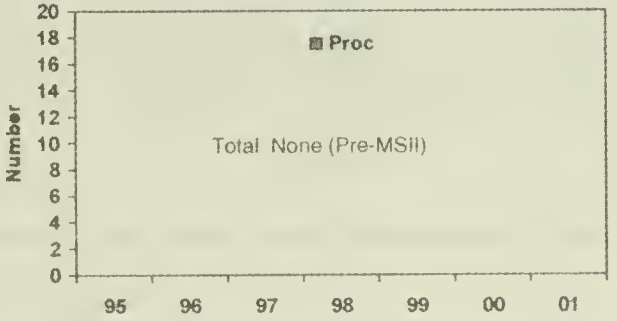
Dr. KAMINSKI. The real potential I think Comanche has I think is in a joint sense.

Mr. SCARBOROUGH. OK. Thank you.

Mr. WELDON. Thank you. Please proceed.

Crusader

Quantities



Objectives

Development

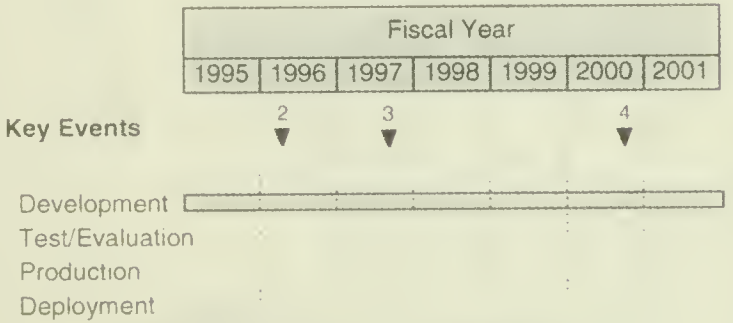
- Regenerative Liquid Propellant Gun
- Auto-loading and Auto-resupply
- Hydropneumatic Suspension

Operational

- Crusader Replaces Paladin/Field Artiliery Ammunition Supply Vehicle (FAASV)
- Reduces crew size from 9 to 6
- Rate of fire of 10-12 Rounds/Minute
- Increases Unassisted Range from 30 to 40 Kilometers
- Increases Assisted Range from 40 to 50 Kilometers
- Provides Fully Digital Environment
- Supports Independent Operations

Crusader

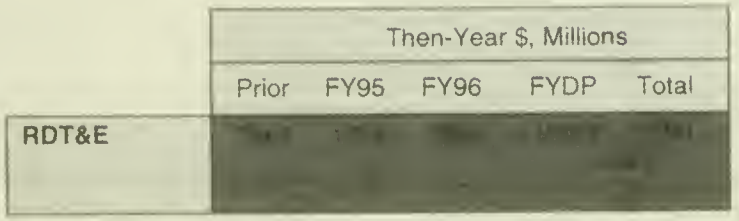
Schedule



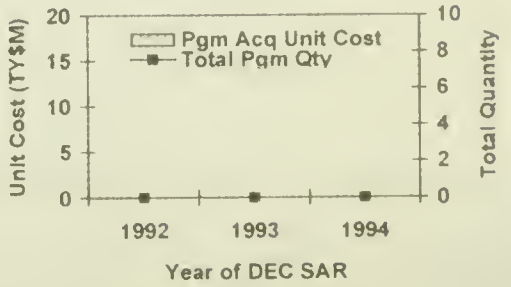
Program Status

Key Event	Date
1. MS I DAB	11/94
2. Dem/Val Contract Award	11/95
3. Propellant System Decision	06/97
4. EMD	06/00
5. LRIP Decision	09/03
6. FUE	09'05
7. Full Rate Production Decision	01/06

Budget



Unit Cost History



Dr. KAMINSKI. The next program is the Crusader program, formerly called the advanced field artillery system. This is the Army's next generation indirect fire cannon and artillery resupply system for the heavy force.

This system is intended to provide an over matching fire power capability which will support the force commander's goal of dominating maneuver battle space and protecting the force. The Crusader will be incorporating advanced technologies to increase accuracy, to increase the rate of fire, to improve survivability and mobility, and also to improve ammunition handling speed.

We also expect to decrease the crew size from nine to six. When this system is fielded it will displace the M109A6, Paladin self–propelled howitzer and the M992 field artillery ammunition supply vehicle in our rapidly deployable and forward deployed forces.

This self-propelled howitzer will improve the range of our 155-millimeter cannon from about 30 kilometers today to over 40 kilometers unassisted and to 50 kilometers using assisted projectiles. It will increase the current burst rate of fire from about 4 rounds per minute to 10 to 12 rounds per minute.

As important as any, it will improve the capability to operate at cross country speeds and highway speeds to be able to keep up with our M1 and M2 force. The resupply vehicle is the companion ammunition handling and resupply vehicle to the self-propelled howitzer.

It will resupply both ammunition and fuel for this system. I have approved Crusader's entry into the demonstration validation phase of development as a single program. The Army awarded a letter contract to United Defense Limited Partnership for this program on December 29, 1994.

Mr. WELDON. Any questions? Mr. Taylor.

Mr. TAYLOR. What size round will it fire?

Dr. KAMINSKI. A 155 millimeter.

Mr. TAYLOR. OK. It will be through the redesign of the round that you get the additional range?

Dr. KAMINSKI. One of the rounds being considered here is a liquid propelled and assisted round to get this extended range up to 50 kilometers.

Mr. TAYLOR. How do you increase the firing rate to such an extent? Will it all be mechanized?

Dr. KAMINSKI. The liquid propulsion is very critical to doing that.

Mr. TAYLOR. I'm talking about the rate from 4 rounds to 12 rounds.

Dr. KAMINSKI. Yes. The combination of the liquid propellant system and the automatic loading of this vehicle in combination are critical to that.

Mr. TAYLOR. Thank you. Thank you, Mr. Chairman.

Dr. KAMINSKI. Plus, this has a very sophisticated fire control as well.

Mr. WELDON. Before we leave that issue, and I yield to Mr. Tanner, the liquid propellant, Dr. Kaminski, has been somewhat controversial. It is my understanding that this is the first time that this has ever been used on the battlefield.

Would you talk to the issue of the use of a liquid propellant and what kinds of problems you are encountering with it?

Dr. KAMINSKI. Yes. It certainly is a new system, a new approach that we do not have an infrastructure for. It represents about 30 percent of our investment in the R&D program developing that liquid propellant portion.

We do have a backup unit charge approach for the system. The liquid propellant is very high leverage giving us this new extended range capability and a great deal more flexibility in terms of number of rounds carried. What you have here is the propellant centralized in a liquid base system as opposed to being metered out round by round.

Mr. WELDON. What happens if we don't get to where you want to be with that. Do we go to some other dry power system?

Dr. KAMINSKI. We have a fall-back unit charge program backing this up.

Mr. WELDON. The gentleman from Tennessee, Mr. Tanner.

Mr. TANNER. You asked my other question I was interested in. Thank you.

Mr. BATEMAN. I would like to follow up on that question if I might, Mr. Chairman.

Mr. WELDON. Yes.

Mr. BATEMAN. If the liquified propellant technology doesn't work out but can you get most of the advantage of the automated loading system with some other alternative?

Dr. KAMINSKI. Yes, Mr. Bateman, we can. Of course, the mobility of the system that I had talked about being able to keep up with the M1 and the A2 will also be there.

Mr. BATEMAN. In terms of the liquified propellant not working, what would be the diminution in the fire rate if you had to go to some other alternative?

It occurs to me that if one technology is very, very risky and difficult, but to get most of the gain, buy something that is much more certain and sure, then it might be better to save the money on that than to put into something else.

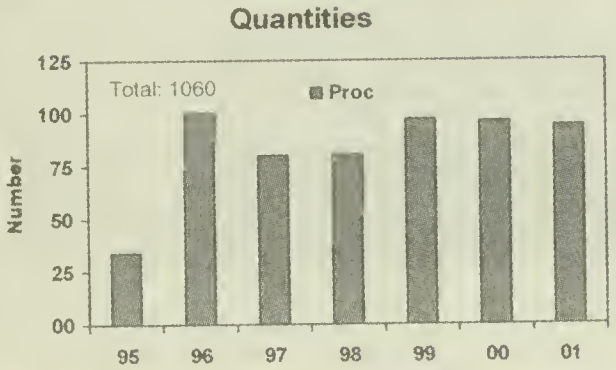
Dr. KAMINSKI. My opinion is that the liquid propellant is very high leverage. It will make a big difference on the efficiency of the system. I don't believe the rate of fire will be—it is such a substantial improvement over what we have today that even with the unit charge, it will be substantially better than the palleted system. I will supply that for the record.

[The information referred to follows:]

RATE OF FIRE

In the event the Army decided against pursuing the liquid propellant technology and selected the fall-back, unicharge-solid propellant approach, there would be no reduction in the required, 10 rounds per minutes rate of fire of the Advanced Fire Artillery System.

M1A2 Upgrade



Objectives

Development

- Continue Abrams Battlefield Superiority
- Integrate 2nd Generation FLIR
- Integrate into "Digitized Battlefield"

Operational

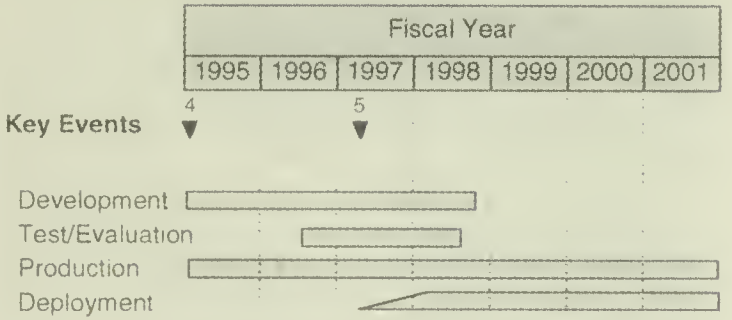
- Upgrades M1 Abrams Tank to Preserve Armored Battlefield Superiority
- 100% Increase in Target Acquisition Capability
- Increased Armor Penetration Capability
- Improved Command & Control and Positioning/Navigation Capability
- Improved Nuclear-Biological Contaminant Protection (eliminates need for protective mask and clothing)

Mr. WELDON. I thank the gentleman. Dr. Kaminski, the staff has asked the GAO to do an investigation of this liquid propellant. We would ask you to assist us in getting the Army to fully cooperate in this 1-month study that is underway right now by the GAO. That will help us better understand some of the problems that are being experienced there.

Any other questions on the Crusader? Thank you.

M1A2 Upgrade

Schedule



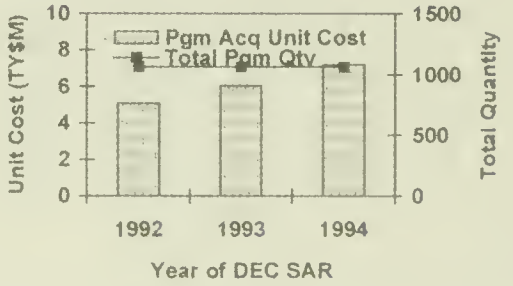
Program Status

Key Event	Date
1. New Tank Production Complete	03/94
2. M1A2 Upgrade Approval	04/94
3. Upgrade Production Contract Award	09/94
4. First Two Upgrades Delivered	10/94
5. First Unit Equipped	12/96

Budget

	Then-Year $, Millions				
	Prior	FY95	FY96	FYDP	Total
RDT&E					
Procurement					
O&M					

Unit Cost History



Dr. KAMINSKI. The next program is the upgrade for the M1A2 system. This upgrade provides several improvements to the basic A1 tank. It involves first of all taking the basic hull, overhauling the engine, overhauling the transmission; then from the M1 version, adding the new 120 millimeter cannon, improving situational awareness through the combination of two FLIR viewing systems and the combination of the global positioning system navigation.

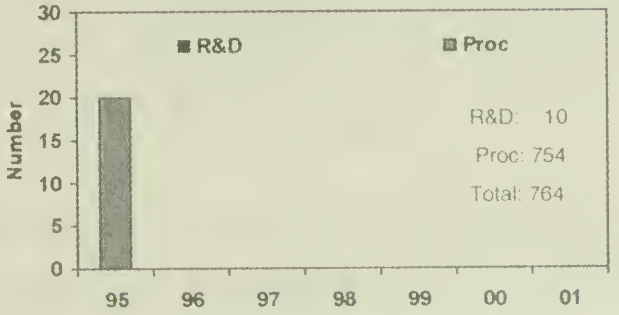
One of the additional key upgrades is the addition of the digital command and communications system for this vehicle. I mentioned earlier the savings of $170 million through a restructuring of this program. If you will look at the procurement levels forecasted in 1997 and fiscal year 1998, those are about 80 per year.

Through the improvements that I talked about, the savings of the $170 million, we anticipate being able to modify an additional 15 tanks per year in each of those years.

Mr. WELDON. Any questions on the money? Thank you.

Multiple Launch Rocket System

Quantities



Objectives

Development

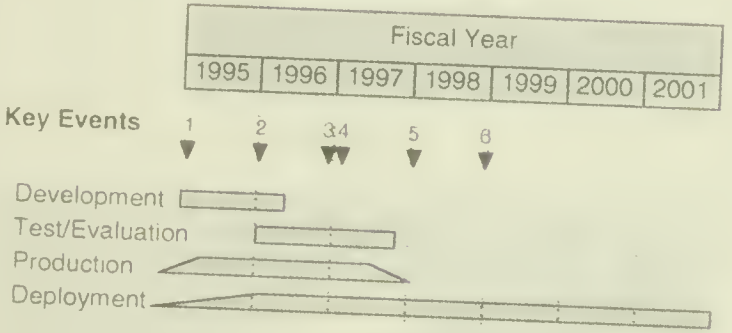
- Vehicle Speed and Range consistent w/ maneuver force
- High rates of fire
- Quick reaction and reload times

Operational

- Counterfire and suppression of enemy air defenses, light materiel and personnel targets
- Supplement tube artillery by delivering large volumes of fire against time sensitive targets
- Engage high volumes of targets beyond range of tube artillery

Multiple Launch Rocket System

Schedule



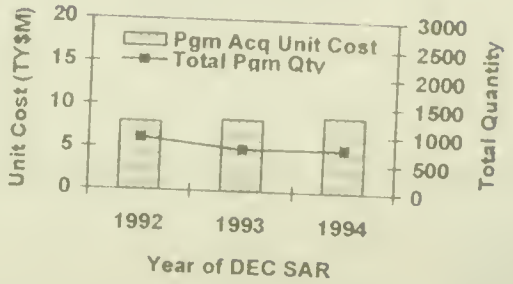
Program Status

	Key Event	Date
1	Last year of Tactical Rocket Procurement	1994
2	Last year of Launcher Procurement	1995
3	Last year of practice rocket procurement	1996
4	Completion of extended range rocket EMD	1996
5	Completion of Improved Fire Control EMD	1997
6	Completion of Improved Launcher Mechanical System EMD	1998

Budget

	Then-Year $, Millions				
	Prior	FY95	FY96	FYDP	Total
RDT&E					
Procurement					

Unit Cost History



Dr. KAMINSKI. The next program is the Multiple Launch Rocket System improvement program. The primary missions of this MLRS system are counter fire and suppression of enemy air defenses, flight material, and personnel.

This is a free flight, area fire artillery rocket system which supplements our canon artillery fires by delivering large volumes of fire power in a short time. The MLRS M270 launcher is now being upgraded to accommodate a new family of munitions which include the Army's Tactical Missile System.

This MLRS system performed extremely well in Operation Desert Storm in which significant numbers of launchers were deployed. All operational requirements were met and in most cases exceeded for readiness, reliability, and maintainability.

MLRS units from the United Kingdom were also involved in Desert Storm and proved the value of this multinational system. The new upgrade MLRS, deep attack launcher, also has demonstrated its enormous capability during the first operational firings of the longer range ATACMS system.

Mr. DORNAN. Could I?

Mr. WELDON. Mr. Dornan.

Mr. DORNAN. Just a small point here.

This system is battle proven. It has been around for a long time. When a Congressman, say, in this large freshman class of 1973, who doesn't have the advantage of being on this committee, is trying to catch up on a lot of these systems, this remains the only Army system that is unnamed. I noticed you quickly named our new mobile artillery, the Crusader, which is excellent. It took me 15 years to get the B–1 bomber named the *Lancer* and not so long to get the B–2 named the *Spirit.*

General Lowe gives me credit for naming it the Spirit. Then each one picks up a name like a battleship. I would really appreciate it if you could do this with one short conversation with Secretary Perry. Name this system.

We lost one of the greatest names for a gun system and it probably deserved to die, was a Sergeant York gun, a division system gun, just because the gun system died doesn't mean the name Sergeant York had to die.

Our guys came up in World War II with great names for systems like this, Stalin's Organ, things like that. Katusha was a Russian name. Name this system. I recommend calling it the Sergeant York so that, that great Tennessee Medal of Honor winner, his name doesn't die with a bad gun system where the costs ran away with us and we killed it.

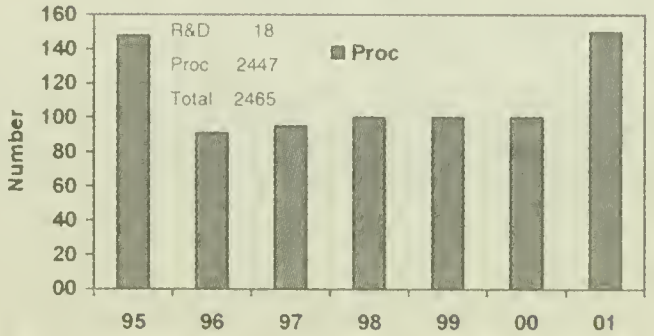
It is just a thought. It is important to the men in the field, I think.

Mr. WELDON. I thank the gentleman.

Dr. KAMINSKI. Next chart please.

Army Tactical Missile System

Quantities



Objectives

Development

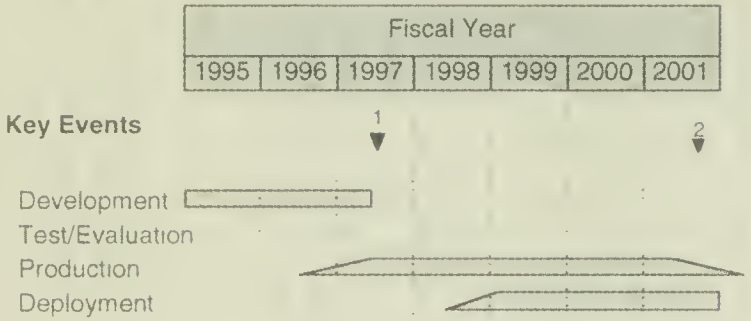
- Block I attacks out to 165 Kilometers.
- Block IA extends range to 300 Kilometers
- Option for Brilliant Antiarmor Submunitions (BAT)

Operational

- Vehicle speed and range consistent with other elements of maneuver force
- Use existing fire direction assets
- Engage full spectrum of deep attack targets -- soft/stationary; hard/moving
- Countermeasure resistance and all weather capable

Army Tactical Missile System

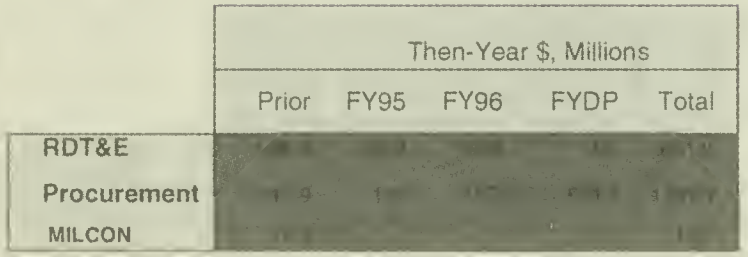
Schedule



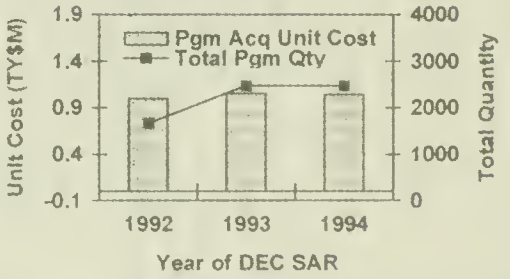
Program Status

Key Event		Date
1.	Block I	Fielded 1990
2.	Block I	Deployed During ODS 1991
3.	Block 1A	(275 ea, M-74APAM) Fielding 1997
4.	Block II	(13 BAT) Fielding 2001
5.	Block IIA	(6 BAT) Fielding 2002

Budget



Unit Cost History



The next program is the Army Tactical Missile System. This system is fired by the MLRS M270 launcher system. It provides the key component of the Army's deep attack capability carrying either Anti-Personnel/Anti-Material, so-called APAM munitions, or the Brilliant Anti-Tank munitions system, the BAT.

ATACMS is the first modern conventional deep attack missile system fielded since the introduction of Lance in 1972. Improvements of the ATACMS block I missile system are designated as block 1A. Next chart please.

This improvement incorporates the global positioning system and a lighter payload to extend the range of ATACMS to 300 kilometers, vice the baseline, 165 kilometers with improved accuracy.

The Army is also developing an alternative carrier for the BAT submunitions in light of the termination of the Army's TSSAM program, or the termination of the Army's portion of it. The Army chose a variant, the so-called block II variant of the ATACMS missile system to incorporate 13 BAT submunitions into the missile with a range of 140 kilometers.

Mr. SPRATT. Mr. Secretary, is that technology taken directly from the TSSAM?

Dr. KAMINSKI. Yes, Mr. Spratt. The BAT munitions was being developed for the TSSAM.

Mr. SPRATT. You are simply using a different delivery vehicle?

Dr. KAMINSKI. Exactly. It is a different delivery vehicle for the same munitions.

Mr. SPRATT. I don't know how much we can discuss about it in open session, but it was always perplexing to me as to how you discriminated among various targets with the submunitions. It would seem to me to be more difficult to do that with this kind of system. Well, I guess not.

Dr. KAMINSKI. It is basically the same problem.

Mr. SPRATT. Basically the same problem. Is it still a problem?

Dr. KAMINSKI. I think we have a pretty good foundation here. It is a difficult problem to do. It requires multiple sensors and some careful algorithms for discrimination. I think we have a pretty reasonable base here. We have done some testing with it and the results are coming out well.

The next program is the V–22, a tilt-rotor aircraft designed to meet——

Mr. TANNER. Mr. Chairman, could I interrupt?

Mr. WELDON. Would the gentleman yield, Mr. Secretary?

Mr. TANNER. While we are on the deep battle weapons, the Army Tactical Missile System, could you just discuss in general where we are with the deep battle weapons developments?

We have got some going on in the Army, some in the Navy, some in the Air Force, and there has been some suggestion that there might be some overlap here. Could you give us an overview real quick of what you are trying accomplish and where you expect to come out?

Dr. KAMINSKI. Yes, Mr. Tanner. First off, I would say there are a number of different ways to approach the deep battle problem. We initiated a few months back, a major department-wide study being done by program analysis and evaluation by PA&E to look at all of our deep attack weapons to see are we on the right founda-

tion? What are the high priority systems in this mix? What are the lower priority systems in this mix?

The study is well underway today to look at this in a systematic way, which I think is what you are getting at; sorting this out in a careful way. That process, that study, that evaluation is in place as we speak.

George, do you know when that is due to come out?

Mr. SCHNEITER. The roles and missions; is that what you are talking about?

Dr. KAMINSKI. It really is looking at the systems involved; the multiple approaches to doing deep attack.

Mr. SCHNEITER. We expect to have interim results on that this June and the final results the following June.

Mr. TANNER. Could we get a quote on that?

Mr. WELDON. Absolutely. I can have staff provide copies for the members on that, if you would provide that to us. Thank you. Please proceed.

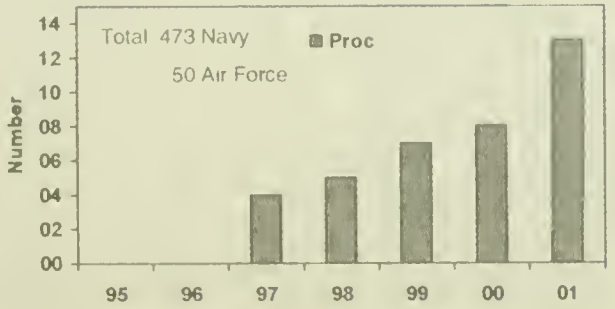
[The information referred to follows:]

DEEP ATTACK WEAPONS MIX

The Director, Program Analysis and Evaluation approved the completion of Phase I and the initiation of Phase II of the Anti-armor Mission Area Analysis on July 24, 1995. The Anti-armor Mission Area Analysis was chartered in October 1993 to examine anti-armor capabilities in order to determine priority among competing developmental and fielded anti-armor systems. The study is examining the effectiveness of selected mixes of weapon systems and munitions in light of the revised threat environment. After the compeltion of Phase II, this cross-service review will develop recommendations on the disposition of the anti-armor programs currently under consideration by the Department. During the Phase I effort, the Department developed the methodology and the analytical modeling techniques and subsequently exercised the analytical framework by performing a proof of principle analysis on twelve anti-armor weapons in a defensive scenario. The Phase II work will entail a full analysis of weapon system option mixes for the time period FY 1998–2003 and will be completed in June 1996.

V-22 Osprey

Quantities



Objectives

Development

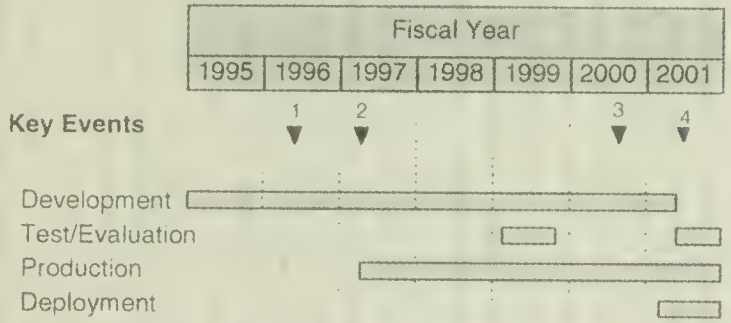
- Confirm Resolution Empennage Buffet
- Improved Hover performance
- Designed for night/adverse weather

Operational

- Replaces the CH-46E (USMC)
- Supports Marine Amphibious Assault and Special Operations Forces (SOF) Deep Penetration Missions
- Provides Self Deployable Capability (up to 2100 nm with 1 aerial refueling)
- Increases Speed from 121 knots to 239 knots

V-22 Osprey

Schedule



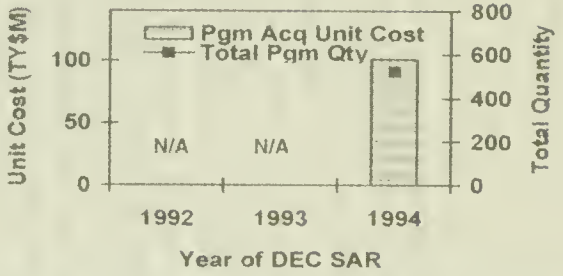
Program Status

Key Event	Date
1. Long-lead contract award	02/96
2. First flight EMD aircraft	12/96
3. MS III	04/00
4. MV-22 IOC	04/01
5. CV-22 IOC	10/05

Budget

	Then-Year $, Millions				
	Prior	FY95	FY96	FYDP	Total
RDT&E					
Procurement					

Unit Cost History



Dr. KAMINSKI. The next program is the V–22, a tilt-rotor aircraft designed to meet the amphibious/vertical assault needs of the Marine Corps, the combat support in Combat Search and Rescue needs of the Navy, and the long-range infiltration and exfiltration missions of the U.S. Special Operations Command.

The V–22 will be capable of flying over 2,100 nautical miles with just one aerial refueling, providing a short take-off aircraft that could resupply or redeploy to any location in the world.

The V–22 completed its first operational assessment in July 1994. Last December, my office approved an acquisition strategy which includes the initial production of both the Marine Corps variant, the MV–22 and the Special Operations Command variant, CV–22, and requested that the Defense Science Board convene a task force to review potential cost reduction strategies to lower the unit cost of this system.

That Defense Science Board task force has now completed its work and it has provided us with its recommendations. We have those currently under review, to look at some potential cost reduction measures.

Mr. WELDON. Dr. Kaminski, on the V–22, there was a press report that circulated yesterday, I believe summarizing an internal document from last August regarding down wash relative to battlefield operations of the V–22.

My understanding is that has not been classified as a show stopper nor a major problem. I would ask you, first, would you agree that the down wash issue is a common and a resolvable one, and second, with respect to that issue, do you see it as a show stopper for the V–22?

Dr. KAMINSKI. I do not see it as a show stopper at this point. I spoke personally last evening with Mr. Coyle, the Director of Operational Test and Evaluation, whose report was the report that was quoted.

In essence what he described to me was the effect of the down wash on troops performing operational tasks beneath the aircraft have only been investigated thus far to a limited degree. The OT–2A, the operational test 2A, that we did last year was constrained by the limited flight time that was available to us.

A complete evaluation of the many questions regarding operational effectiveness is not able to be done at this point. We plan to conduct a dedicated period of OT&E this spring to further evaluate the down wash issues and to look at what mitigating tactical procedures we might take to work around this.

We certainly have had problems of this sort with the MH–53 helicopter during its development. These are of a similar nature. I would say we have a little more work to do to fully bound the nature of this problem.

Mr. WELDON. Mr. Bateman has the floor.

Mr. BATEMAN. Mr. Chairman, maybe I misheard this, but what I thought I heard you say was that the V–22 would have a self-deploying capability of something like 2,100 miles. The chart indicated 1,260 nautical miles.

Dr. KAMINSKI. Mr. Bateman, the difference is that the 2,100 nautical miles that I referred to was with one refueling. The 1,296 is without the fueling, just self-deployed.

Mr. WELDON. I thank the gentleman. Mr. McHale.

Mr. MCHALE. Thank you, Mr. Chairman.

Mr. Secretary, I was pleased to hear your comments regarding the tentative assessment of the down wash problem as described in the news article referenced by Mr. Weldon.

I, too, read that article. I would hope that, that particular challenge would not be blown out of proportion. As somebody who has spent a considerable amount of time in tactical operations beneath CH–46's and 53's, it is inevitable with this type of aircraft, that there would be a down wash and that it will have an impact upon the tactical deployment of troops beneath the aircraft.

The whole purpose of the V–22 is to be able to conduct an over-the-horizon assault into an undefended LZ, rather than being compelled at a much slower rate of speed to land in an LZ where the tactical considerations and the possibility of an enemy attack are far more eminent. I'd like to be kept abreast of the ongoing assessment of any adverse impact of the down wash situation of the V–22, but frankly I felt when I read that article over the weekend that the tactical challenge, one that I think is inevitable, was being blown out of proportion in terms of a potential criticism of the V–22.

If you talk to anybody who has operated with CH–46's and 53's, people who are intimately familiar with this particular problem, they will tell you that it is one, particularly in an undefended LZ, that can be easily overcome by appropriate tactical measures.

I wanted to toss in that comment. I don't see this as a show stopper. I would hate to see the reports of this assessment blown out of proportion the tactical challenge that is involved. It is critically important, I think, that we go forward with the V–22 so that we send those Marines into an undefended LZ, having a launch from over-the-horizon moving at great speed and adopting principles of maneuver warfare, rather than send them in with a CH–46, where frankly in light of modern weaponry, they are sitting ducks.

Mr. WELDON. I thank the gentleman.

Before I yield to our ranking member my understanding is that this was one of 32 items looked at in this overview of the V–22. I think that lends itself to someone taking perhaps this out of context. Mr. Spratt.

Mr. SPRATT. Thank you, Mr. Chairman.

I can't see the procurement line, Mr. Secretary.

Dr. KAMINSKI. The number under the total?

Mr. SPRATT. Yes, sir.

Dr. KAMINSKI. Let me see if I can read it, 45956.

Mr. SPRATT. It is $45.9 billion. So, the total cost of the program in then year dollars is $46 billion?

Dr. KAMINSKI. That's correct.

Mr. SPRATT. That is for how many units?

Dr. KAMINSKI. That is for about 600 units. I am having a little trouble reading that from this angle, but it is far over on the right-hand side. Do you see the little red dot?

Mr. SPRATT. So, that comes to about $80 million a copy?

Dr. KAMINSKI. That's correct, with the amortized R&D cost and the procurement cost.

Mr. WELDON. Will the gentleman yield on that?

Mr. SPRATT. Yes, sir.

Mr. WELDON. My understanding is that the current fly away cost was somewhere in the midthirties and that the contractors, the Navy, and the corps were looking through use of this advanced design system, to get that cost down to approximately $29.4 million per copy.

Is the difference in the per copy cost because you are adding in the R&D dollars?

Dr. KAMINSKI. That, plus these are in then year dollars. The numbers you are quoting I think are——

Mr. WELDON. The goal of the aircraft per copy is still under $30 million per copy. Is that correct?

Dr. KAMINSKI. I will have to check that. I will have to supply that for the record.

Mr. SCHNEITER. I think it is not that low at this point. We just got some input from the Defense Science Board on that. We are looking at that. I think they are talking more in the midthirties.

Mr. WELDON. Will the gentleman further yield?

Mr. SPRATT. Certainly.

Mr. WELDON. For the record, would you give us those numbers that you have?

V–22 FLYAWAY AND PROGRAM ACQUISITION UNIT COST

Flyaway and Program Acquisition costs for the V–22 are based on 425 MV–22s, 50 CV–22s (less unique items), and 48 HV–22s (less unique items) at a production rate limited by $1B (FY 1994 constant dollars) per year procurement cap.

The unit flyaway cost is $31.6M in constant FY 1986 base year dollars, $43.0M in FY 1996 constant dollars, and $67.8M in then year dollars.

The $29.4M is a unit flyaway target in FY 1994 constant dollars which has been quoted by the contractors over the last year. It is based on several aggressive assumptions including multiyear procurements, foreign military sales, reduced government oversight, and investment in cost reduction activities.

The Program Acquisition Unit Cost is $51.7M in FY 1986 base year dollars, $70.4M in FY 1996 constant dollars, and $101.2M in then-year dollars.

Mr. SPRATT. Is that the flyaway cost constant baseline dollars? Is that what that would be?

Dr. KAMINSKI. I believe that is unit flyaway cost and a constant dollar a year base. I don't remember the year.

Mr. SCHNEITER. I don't either. We will provide that.

[The information referred to follows:]

PROVIDE V–22 UNIT FLYAWAY COSTS AND PAUC IN CONSTANT AND THEN-YEAR DOLLARS

Flyaway cost for the V–22 is based on 425 MV–22s, 50 CV–22s (less unique items) and 48 HV–22s (less unique items) at a rate limited by a $1B cap in FY 1994 constant dollars.

The unit flyaway cost is $31.6M in constant FY 1986 base year dollars, $43.0M in FY 1996 constant dollars and $67.8M in then year dollars.

The $29.4M is a unit flyaway estimate in FY 1994 constant dollars which has been quoted by the contractors over the last year. It is based on several aggressive assumptions including multiyear procurements, foreign military sales, reduced government oversight and investment in cost reduction activities. The Defense Science Board (DSB) has recently reviewed cost reduction strategies for the V–22 and has considered some the assumptions cited above. Their initial assessment is that $35–36M is reasonable estimate to characterize the cost of the aircraft and that implementing the DSB recommendations will push cost towards the contractor estimate.

The Program Acquisition Unit Cost is $51.7M in FY 1986 base year dollars, $70.4 in FY 1996 constant dollars and $101.2M in then-year dollars.

Mr. SPRATT. On the first chart you showed that one of the first objectives was the empennage buffets. Is there instability in the empennage?

Dr. KAMINSKI. There was some buffeting in the empennage with the original design. Part of this development program was to address that. That has been improved.

Mr. SPRATT. Is that the problem that caused the crash to the airplane?

Dr. KAMINSKI. No. I think that was another issue.

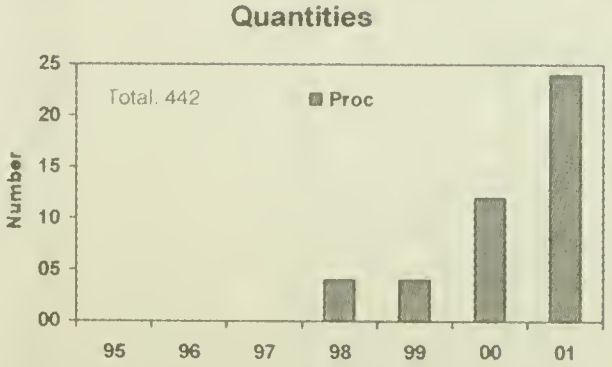
Mr. WELDON. My understanding is that one was due to a manual miswiring, the one that happened at the Wilmington Airport. The second that caused a loss of life was an improperly designed and installed seal that has since been taken care of.

Dr. KAMINSKI. That's correct. It was a seal.

Mr. WELDON. It caused a leakage of a lubricant which caused a fire explosion.

Mr. SPRATT. Thank you.

F-22 Advanced Technology Fighter



Objectives

Development

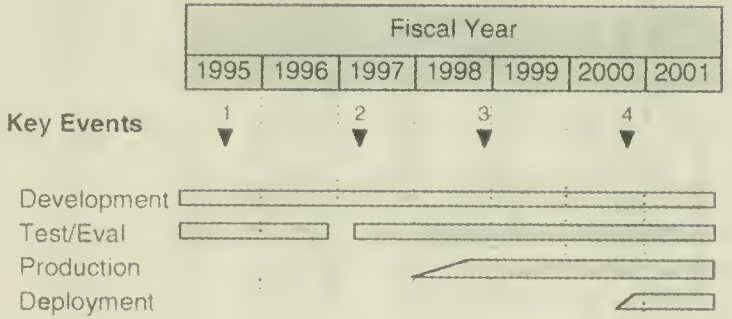
- Highly maneuverable aircraft with reduced observability
- High thrust-to-weight engine with vectoring nozzle
- Integrated avionics system

Operational

- Replaces F-15 in Air Superiority Role
- First Look-Shot-Kill Capability
- Superior agility coupled with supercruise and reduced observability
- Significantly increased reliability, maintainability, supportability

F-22 Advanced Technology Fighter

Schedule



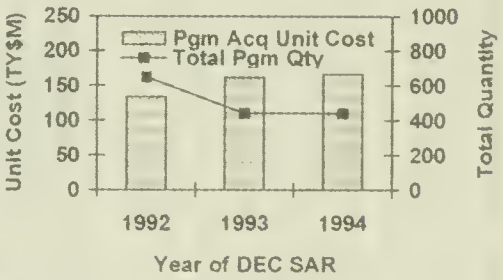
Program Status

Key Event	Date
1. CDR (Air Vehicle)	02/95
2. First Flight	02/97
3. Low Rate Production (CA)	09/98
4. Initial Production Delivery	09/00
5. IOC	05/04

Budget

	Then-Year $, Millions				
	Prior	FY95	FY96	FYDP	Total
RDT&E					
Procurement					

Unit Cost History



Dr. KAMINSKI. The next program is the F–22, our next generation air superiority fighter that will replace the F–15. The F–22 will ensure U.S. dominance in the air and pose a powerful deterrent to aggression.

Air superiority will continue to be prerequisite for success in all of our military operations. The F–22's incorporation of stealth, super cruise, agility, and advanced avionics, combined with the superior skills or our pilots will permit U.S. aircraft to achieve first look, first shoot, and first kill capability. The F–22 also possesses significant ground attack capabilities that will permit the joint force commander to employ the aircraft against a wide variety of targets.

The F–22 successfully conducted a competitive demonstration validation program in the 1986 to 1991 time period. Approval to enter engineering and manufacturing development was granted in August 1991.

At the request of the Congress, the Department recently concluded an independent Defense Science Board Review of the concurrence and the risk in the F–22 program. The Defense Science Board concluded that the program has acceptable concurrence and the risk associated with entry into rate production are readily controllable through monitoring enforcement of the key demonstration tests incorporated in the program plan.

The air vehicle critical design review was completed on time last month and there are only a small number of open items that were needed to be brought to closure. These open issues are expected to be resolved by June 1995. I view this as outstanding for a program this large and this complex.

Mr. SPRATT. Mr. Secretary, if I could just go through the same basics on this. How many units is the current program?

Dr. KAMINSKI. Just a little over 400.

Mr. SPRATT. OK. I see the chart now, 442. The curve then denotes the——

Dr. KAMINSKI. That curve shows as of the year of our selection, selected acquisition report, the history of our project on of the number we were expecting to buy. As you can see that was adjusted downward.

Mr. SPRATT. You are looking at then-year dollars, everything amortized, $53 billion.

Dr. KAMINSKI. That's correct.

Mr. SPRATT. That is about $110 million program unit cost in then-year dollars.

Dr. KAMINSKI. Yes.

Mr. SPRATT. Do we have a norm, a baseline, a cost baseline that we are trying to hold the procurement objectives to?

Dr. KAMINSKI. Yes, we do. That bar, as you can see, that is about $150 million amortized then-year dollars. That is the unit cost.

Mr. SPRATT. $150 million per unit.

Dr. KAMINSKI. $150 million then-year dollars.

Mr. WELDON. My understanding is that approximately $700 million in cuts to this program over the past 3 years by both the Congress and the budgetary request has caused the program to increase by a total of about $6 billion. I would ask if that in fact is

the case? If you don't know the answer, could you provide that for the record.

Dr. KAMINSKI. What I would like to do is provide a complete description for the record because this gets confused between constant and then-year dollars. I will just give you a brief overview. The more major adjustment the $700 million reduction taken in previous years contributed about a billion dollar growth in the R&D Program, most of which is a real growth. Plus, about a $3 billion growth in the procurement program.

That $3 billion is all the result of inflation. The same procurement program, it was just slipped out a couple of years as the result. Of course, there was another increase in the program cost due to the $200 million reduction. I will supply those to you for the record in then-year and in constant dollars.

[The information referred to follows:]

F–22

Since approval of the Engineering and Manufacturing Development (EMD) phase in August 1991, there have been two rephasings of the F–22 program. The initial rephasing occurred in 1993 and was the result of a $287M congressional cut in FY93. The second rephasing has recently been concluded. This rephasing was the result of a combined $163M congressional cut in FY94 and a $100M OSD in FY95. The cost growth in the program as a result of these two rephasings is detailed below. A third rephasing is currently underway as result of the combination of a $110M congressional cut in FY 95 and a $200M OSD cut in FY96. The impact of this third rephasing on overall program cost growth is yet to be determined.

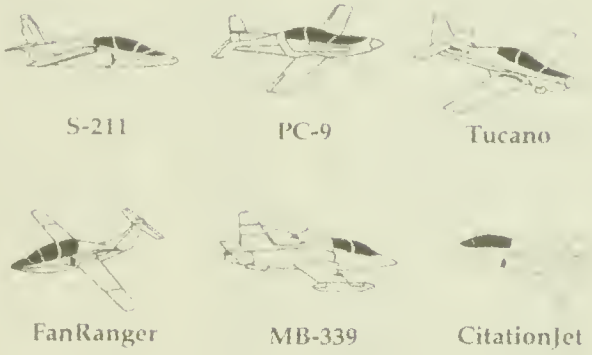
PROGRAM COST INCREASE TO DATE

[TY$ in millions]

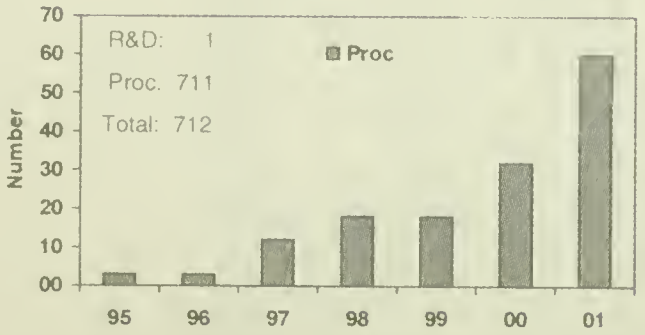
	Contract cost (RDT&E)	Production estimate	Total
Rephase #1 (FY93)	734	1,500	2,234
Rephase #2 (FY94/95)	617	1,500	2,117
Total increase	1,351	3,000	4,351

Mr. WELDON. Any other questions on the F–22?

Joint Primary Aircraft Training System



Quantities



Objectives

Development

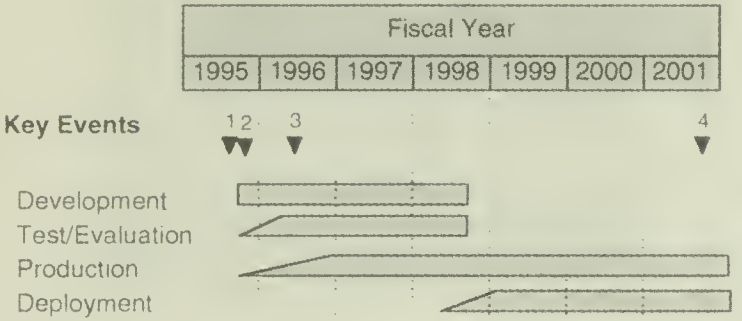
- Missionized aircraft
- Manufacturing Production Line
- Ground Based Training System

Operational

- Replaces Air Force T-37 and Navy T-34 Primary Trainers
- Improves Pilot Accommodation
- Corrects Deficiencies in Performance, Safety, and Supportability

Joint Primary Aircraft Training System

Schedule



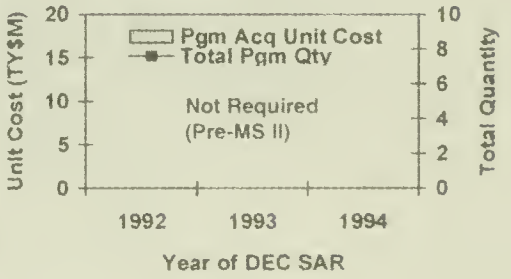
Program Status

Key Event	Date
1. Announcement of Winner	Jun 1995
2. Aircraft Contract Award	Aug 1995
3. Ground Training System Dev Start	FY 1996
4. IOC Air Force	FY 2001
5. IOC Navy	FY 2003

Budget

	Then-Year $, Millions				
	Prior	FY95	FY96	FYDP	Total
RDT&E					
Procurement					

Unit Cost History



Dr. KAMINSKI. The next program is the JPATS Program. This is the key to implementing joint fixed wing pilot training for both the Navy and the Air Force. JPATS include aircraft, a ground based training system, and contractor logistics support.

The JPATS aircraft will replace aging Air Force T–37 and Navy T–34 primary trainers, both of which have significant performance and supportability deficiencies. The Air Force plans to acquire 372 aircraft. The Navy will acquire 339.

The initial operational capability for the Air Force's plan for fiscal year 2000, with the Navy to follow in fiscal year 2003. This is a DOD acquisition pilot program which is currently in source selection. We would expect award of the contract in August of this year.

Mr. SPRATT. How many candidates are participating in the competition?

Dr. KAMINSKI. Seven initial candidates. One of those is now removed from the competition.

Mr. SPRATT. So, there are six candidates all together.

Dr. KAMINSKI. Six remaining.

Mr. SPRATT. This is a fly off; Everyone has—to compete, including Cessna. Their's has been rolled out and is in operable condition.

Dr. KAMINSKI. Yes, sir.

Mr. WELDON. On that point, how many are foreign manufacturers out of the six?

Dr. KAMINSKI. There are five aircraft based on foreign designs. I would like to check that.

Mr. SCHNEITER. It is all except one.

[The following information was submitted for the record:]

The Joint Primary Aircraft Training System (JPATS) is currently in source selection. The table below lists the offerors who have responded to the Request For Proposal (RFP). All offerors are U.S. companies. In some cases, their proposed airplanes have a foreign heritage.

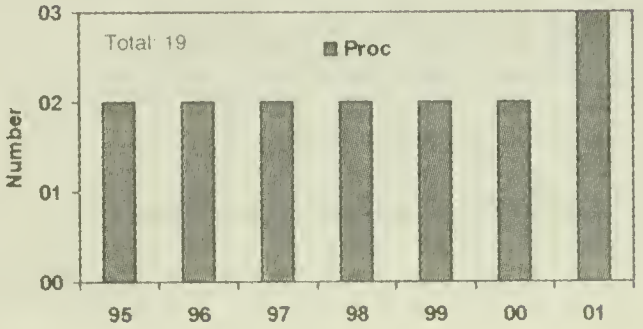
U.S. Prime	Aircraft	Type
Beech	PC–9MkII	Turboprop
Cessna	Citationjet	Turbofan (2)
Grumman	S.211	Turbofan
Lockheed	MB–339	Turbojet
Northrop	Tucano H	Turboprop
Rockwell	Ranger 2000	Turbofan
Vought[1]	Pampa 2000	Turbofan

[1] Note that the Pampa Aircraft is no longer in the competition.

Dr. KAMINSKI. All but Cessna, perhaps. Next chart.

JSTARS

Quantities



Objectives

Development

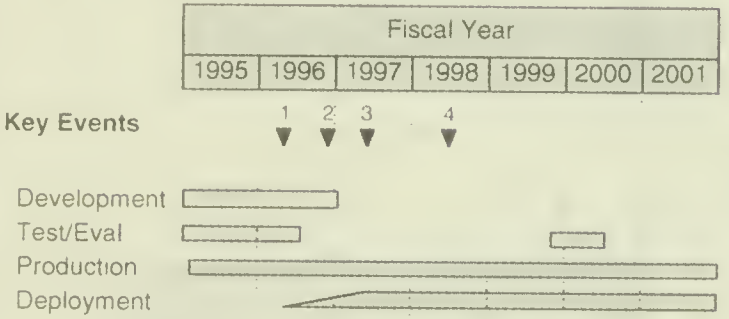
- Wide Area Surveillance/Moving Target Indicator radar coverage of large area
- Synthetic Aperture Radar capability
- Onboard processing & mission crew; connectivity to ground stations

Operational

- Provides new capability to detect, locate, classify and track ground targets
- Moving target detection
- Ability to see big picture clearly, consider enemy movements/maneuver in overall context of the battlefield
- Engage targets before they enter main battle area

JSTARS

Schedule



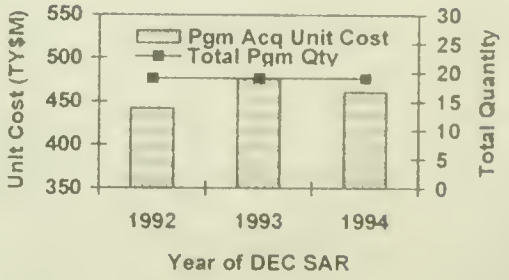
Program Status

	Key Event	Date
1.	Delivery first LRIP aircraft	02/96
2.	DAB MS III	08/96
3.	IOC	03/97
4.	Delivery of last 6 LRIP aircraft	03/98
5.	Delivery of last 19 aircraft	FY03

Budget

	Then-Year $, Millions				
	Prior	FY95	FY96	FYDP	Total
RDT&E					
Procurement					

Unit Cost History



The next program is the Joint Surveillance Target Attack Radar System or JSTARS. JSTARS is a joint Army and Air Force program, with the Air Force as the lead service. Its purpose is to field a common battle management and targeting capability to detect, locate, classify, and track moving and stationary targets for situation assessment, to avoid surprise and to attack targets out to the range of existing and developing weapons.

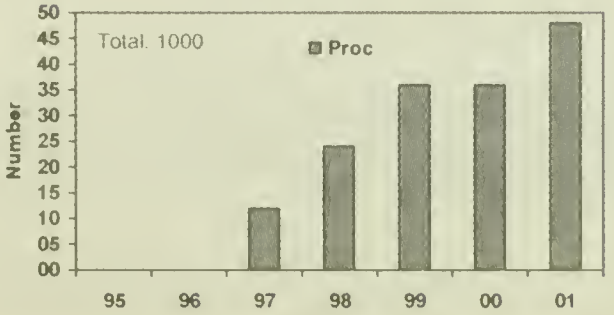
The radar data from the JSTARS are distributed to ground station modules, so-called GSM's, via secure surveillance and data control link. The Air Force is developing and producing the air component of JSTARS the E–8C aircraft which the Army is developing and producing the ground station module systems.

JSTARS flight test aircraft were successfully employed in Desert Storm and flew numerous demonstration missions in Europe last year during EUROSTAR. As I indicated earlier, the NATO Military Committee endorsed the requirement for an alliance ground surveillance capability. The JSTARS is the U.S. candidate in that assessment that is currently underway through the embryonic program office.

Mr. WELDON. Questions on JSTARS? We had a couple earlier, so that's fine.

F/A-18 E/F

Quantities



Objectives

Development

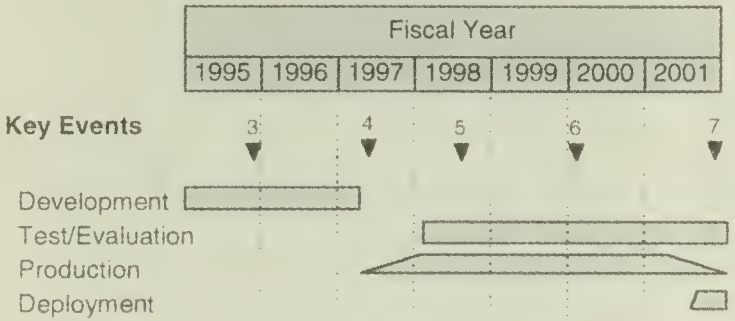
- Provide major modernization for F/A-18C/D fleet to incorporate enhanced survivability, carrier suitability and combat performance, while providing built-in growth potential for additional enhancements.

Operational

- Replaces F-18 C/D
- Reduced Signature and Improved Survivability
- 35% Increase in Mission Radius
- 50% Increase in Endurance
- 22% Increase in Weapons Capacity

F/A-18 E/F

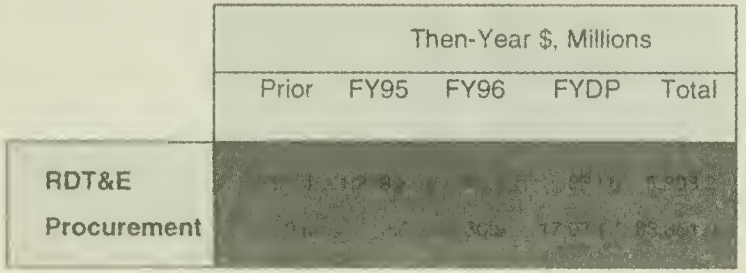
Schedule



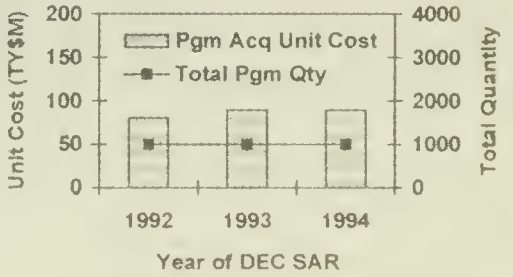
Program Status

Key Event	Date
1. MS IV Approval	1992
2. Critical Design Review	1994
3. First Flight	Dec 1995
4. LRIP (12 Aircraft)	1997
5. OPEVAL	1998
6. Full-Rate Production	2000
7. IOC	2001

Budget



Unit Cost History



Dr. KAMINSKI. We do not have a slide for the F–18E and F–Hornet Program. If I might just give a brief description of that program.

The F–18E/F is key to the near-term modernization of naval aviation, providing significant enhancements to the combat proven F–18C/D. The E/F will provide greater range, about 35 percent more range than the C/D, and greater loiter, about 50 percent more endurance than the C/D, as well as increased weapons carriage, and survivability.

In addition, it will arrive with significant future growth potential designed into the system. I would note that the C/D models currently field are about at the end of their maximum capability for avionics cooling, electrical power, and weight.

The program is now in engineering and manufacturing development, with the first developmental air frames currently under construction. In accordance with the RDT&E cap of $4.8 billion imposed by the Congress, the program is fully funded and on schedule for an IOC in 1998.

Our final C/D procurement will be in 1996 with all future Hornet procurement planned for the E/F model thereafter. The E/F passed its critical design review in June of this year. It is on schedule for a first flight at the end of 1995.

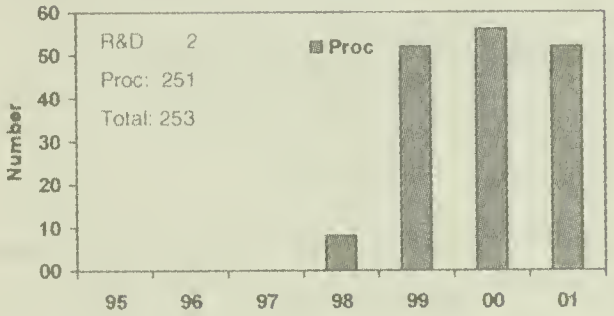
Mr. WELDON. Dr. Kaminski, the key question here is can we complete this within that $4.9 billion that Congress has mandated. What's your assessment?

Dr. KAMINSKI. I believe we can, Mr. Chairman. The $70 million reduction that we got last year I think has us close to the stops for the program. I believe we can without further perturbations complete the program.

Mr. WELDON. Questions? Thank you.

F-14 Precision Strike Upgrade

Quantities



Objectives

Development

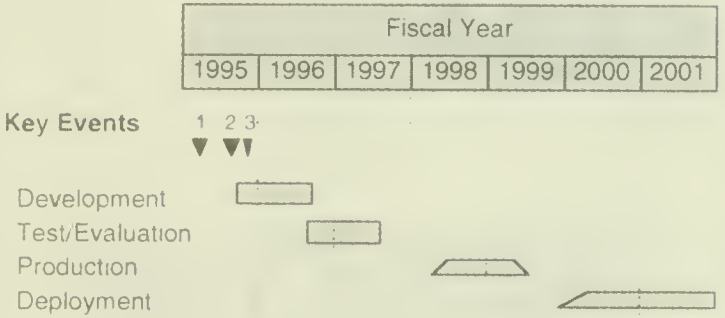
- Provide an affordable and compressed acquisition cycle program for precision guided munitions (PGM) attack capability on the F-14 fighter aircraft

Operational

- Improves Ground Attack Capability of F-14 A,B & D Models
- Adds day and night precision air-to-ground capability fo the 14 F-14s on each carrier
- Increase striking power of each carrier air wing from 36 to 50 strike fighters, each with day and night PGM capability

F-14 Precision Strike Upgrade

Schedule



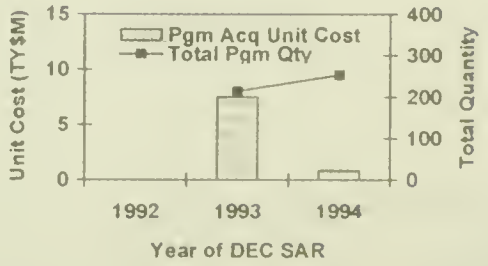
Program Status

Key Event	Date
1. COEA Completion	03/95
2. Milestone Decision	07/95
3. Congressional Report	07/95
4. IOC F-14D	FY00
5. IOC F-14A/B	FY01

Budget

	Then-Year $, Millions				
	Prior	FY95	FY96	FYDP	Total
RDT&E					
Procurement					

Unit Cost History



Dr. KAMINSKI. The current F–14 program consists of a modest upgrade of strike capability for 251 aircraft. This is reduced upgrade with respect to what was described last year. It will provide 14 additional precision guided munitions capable multi-role fighters to each carrier air wing.

This enhancement is especially important as the A–6 Fleet retirement is completed in 1997. With the F–14 day and night precision strike capable, each wing will then have 15 multi-role aircraft for its power projection role; 36 of the F/A–18 Hornets, and 14 Tomcats.

A cost and operational effective analysis looking at the various approaches to provide this upgrade has been recently completed. I have not seen that review yet. It is about to be presented to me in June of 1995.

Two of the type of capabilities that are being looked at here as alternatives involve, one, including the JDAM, GPS guided munitions providing a day, night, all weather capability. Another approach providing a FLIR, laser targeting pod capability which would provide a day, night, and under weather capability with more precision than would be offered with the JDAM approach. Our preliminary estimates indicate that this program can be accomplished at a total cost of less than $300 million, with an IOC of fiscal year 2000. So, that is just a little over a million dollars per aircraft. The funds requested in the 1996 budget include, $25.4 million for development.

Mr. WELDON. Dr. Kaminski, we seem to have a gap here. We retire the A–6E in 1997 and yet we don't start delivery of the F–14 upgrade until the year 2000. Does the 3-year time gap suggest that perhaps we ought to slide the A–6E retirement a couple of years?

Dr. KAMINSKI. I don't think it should, Mr. Chairman. I think we have a capable aircraft in the F–18. There is a gap we have to face. My opinion is, we ought to get on with the F–14 upgrade as soon as we can. That is where we should invest our funds.

Mr. WELDON. But not necessarily reconsider the decision to retire the A–6E in 1997?

Dr. KAMINSKI. No. I don't believe we should reconsider that.

Mr. WELDON. Mr. Spratt, do you have a question?

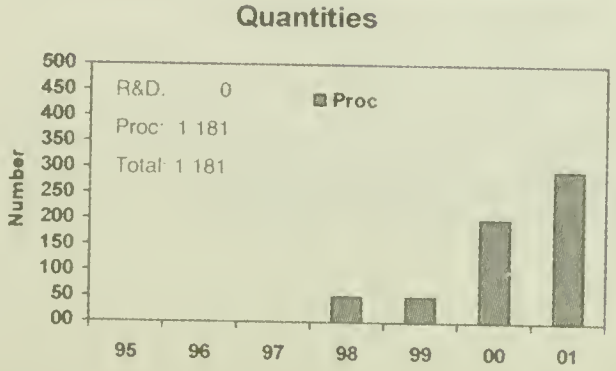
Mr. SPRATT. Does this mean that you are equipping all of the F–14D's with this precision strike capability?

Dr. KAMINSKI. We will actually be equipping more than the Ds.

Mr. SPRATT. I see the A and B coming on after that. So you will do all of the D's and some of the A's and B's.

Dr. KAMINSKI. Sir, this will be 251 aircraft. I believe there are 53 D models.

Tomahawk Baseline Improvement Program (TBIP)



Objectives

Development

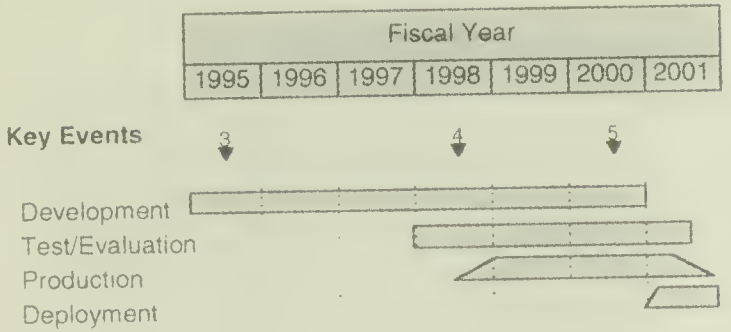
- Electro-Optical Seeker Provides Real Time Bomb Damage Assessment
- Upgrades ship and submarine weapon control systems

Operational

- Provides Existing Block III System with Quick Reaction, Tactical Strike Capability
- Improves Afloat Planning System
- Enhances Accuracy and Targeting

Tomahawk Baseline Improvement Program (TBIP)

Schedule



Program Status

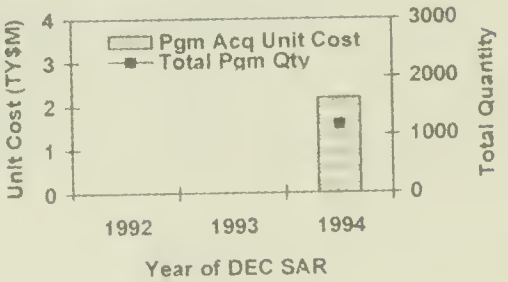
Key Event	Date
1. Block III IOC	May 1993
2. TBIP EMD Contract Award	Sep 1994
3. Precision Strike Initiative Flight Test	Apr 1995
4. TBIP LRIP Decision	FY 1998
5. TBIP IOC	FY 2000

Budget

Then-Year $, Millions

	Prior	FY95	FY96	FYDP	Total
RDT&E					
Procurement					

Unit Cost History



The Tomahawk is capable of autonomous precision strikes deep into unfriendly territory, as well as sustained salvos in combat. We have been through a series of improvements with the Tomahawk Program. The Block-3 Program already in place today has improved the baseline system to add global positioning system guidance, improved insensitive warhead, better control of time on target, and an improved terminal guidance system.

This program, the Block-4 TBIP Program, the so-called Tomahawk Baseline Improvement Program will go another step further to provide a TV sensor capability along with a data link and an improved terminal sensor, an imaging infrared sensor, derived from the family developed for the TSSAM system.

This baseline improvement program will give the Tomahawk increased accuracy, better reliability with reduced collateral damage by the year 2000.

Battlefield Combat Identification System

Objectives

Development

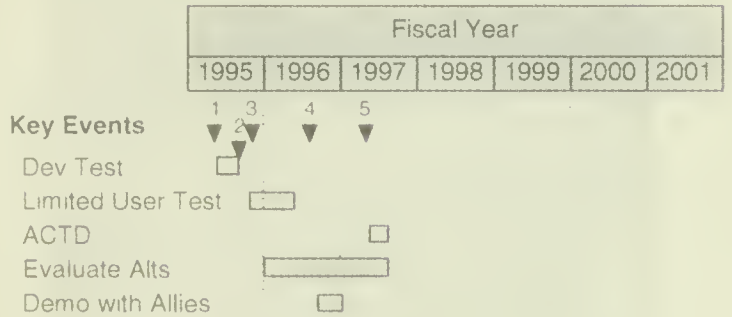
- 5 Km range (ground to ground)
  8 Km range (air to ground)
- Rapid, automatic response
- Display integral to thermal viewer

Operational

- Reliable capability to identify friendly vehicles
- Interoperability with key Allies
- No reduction in weapon effectiveness

Battlefield Combat Identification System

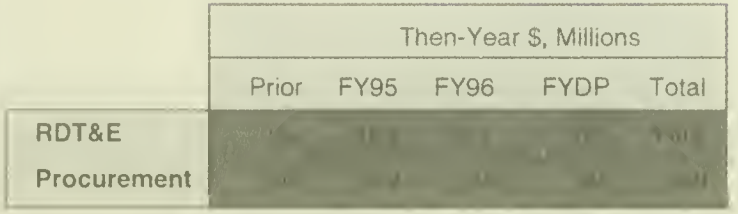
Schedule



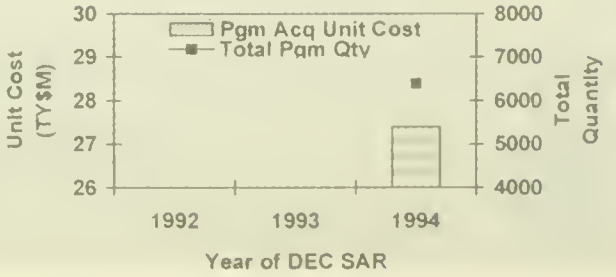
Program Status

Key Event	Date
1. Start Development Test	05/95
2. Complete Development Test	08/95
3. User Test	10/95
4. Allied Demonstration	09/96
5. ACTD (with Force XXI)	02/97

Budget



Unit Cost History (Estimated)



The next program is the Battlefield Combat Identification System. The Department here adopted a multi-faceted strategy in response to the armor fratricide that was suffered in Operation Desert Storm.

Simple devices including flashing laser beacons and reflective panels have already been purchased on a "quick fix" basis for this problem. At the National Training Center, increased emphasis is being placed on identification and looking at more sophisticated solutions.

With respect to more sophisticated solutions, the Army tested a number of off the shelf systems in 1992 as candidates for near-term application and they selected a particular approach, a millimeter-wave Q&A, querry and answer system, which evolved into this system called BCIS, Battlefield Combat Identification System.

Initial development tests of the system show very good results in ground to ground applications. We are also interested in the ground to air, air to ground applications. However, the BCIS system is not inexpensive. Before the Department commits a large investment in the system, we intend to carefully evaluate all of the alternative approaches.

We are considering a plan that would include advanced concept technology demonstration on BCIS in early 1997, as well as advanced concept technology demonstrations of competing approaches in the same time frame.

Following these demonstrations, the Department will be in a position to make an informed decision on both the near-term and the long-term approaches for this very important requirement.

Mr. WELDON. Dr. Kaminski, we have seen this program grow perhaps more dramatically than others. I think we all agree that it is of the highest of importance after what we saw occur in Desert Storm with the friendly fire that occurred there and some of our own troops were killed. The ultimate goal here is to have one unified system. Is that correct?

Dr. KAMINSKI. I think the ultimate goal, Mr. Chairman is for us to have what I call a situation awareness tree that goes through the battlefield. It would allow for more than one sensor to be used.

We have to have this family trunk to which all of the branches attach. Our critical aim here is to keep the cost down. We are going to be equipping so many platforms we want to really do this in a careful and systematic way.

Mr. BATEMAN. Mr. Chairman.

Mr. WELDON. Yes——

Mr. BATEMAN. Did I properly interpret a figure on the prior chart that said there were 140 systems under evaluation?

Dr. KAMINSKI. The 140 systems, Mr. Bateman, were to be procured for evaluation. That is 140 units, not 140 different systems. We were going to buy 140 copies and then evaluate them in a unit.

Mr. WELDON. Mr. Kennedy.

Mr. KENNEDY. Would you quickly review what a "quick fix" application of a battle verification program looks like?

Dr. KAMINSKI. We deployed in Desert Storm a number of quick fixes. For example, flashing beacons, small laser diad beacons which someone could identify the pulse repetition frequency; not

unlike the cricket system that was used in World War II; quick field mod, not long term.

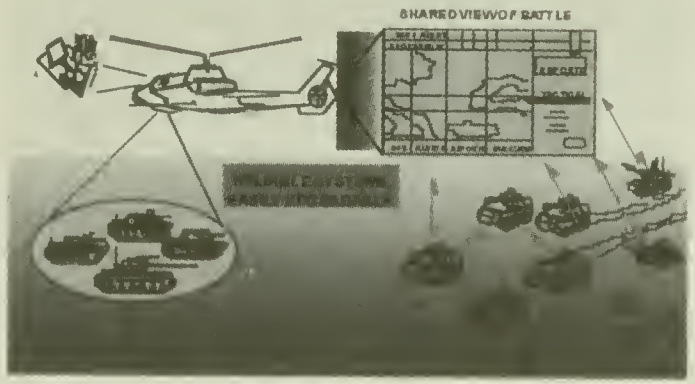
Mr. KENNEDY. What does the new identification program look like that builds on that. What is the technology? Are you just saying that now you want to make sure that it is uniform?

Dr. KAMINSKI. Mr. Kennedy, the particular BCIS system is one example. It uses a millimeter-wave system that transmits out a query pulse and it asks who are you, then a coded response comes back on a millimeter wave length telling who you are.

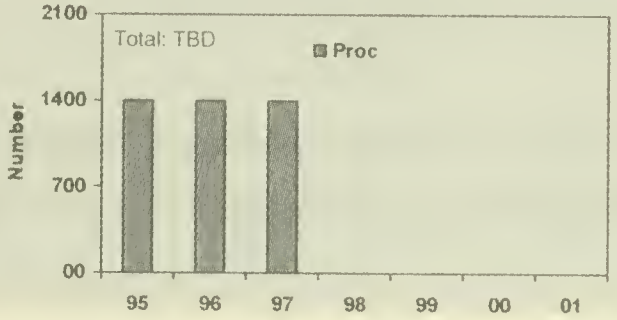
This is one system that looks like it will work well ground to ground. Our issue is that this is not an inexpensive system. There are other families of things that we could look at that would plug into this tree that I was describing as being the situation awareness trunk.

A part of this trunk is simply knowing where people are on the battlefield; that is, having position information from a global positioning system. What I want to do is have the very cheapest system that we can field that is reliable and has growth capabilities. This BCIS is just on example.

Army Digitization of Battlefield



Applique Quantities



Objectives

Development

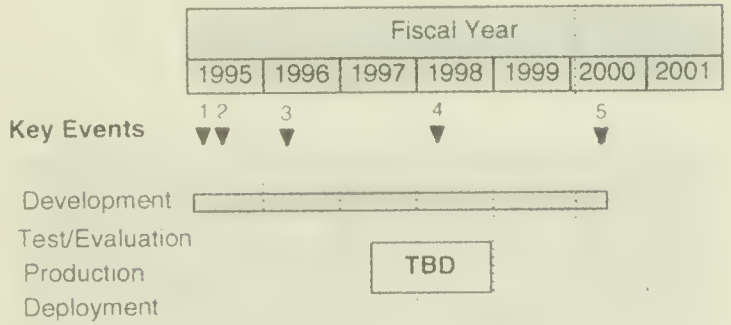
- Integration of Army digitization efforts
- Acquisition Streamlining
- Utilizes commercial standards/open signals

Operational

- Joint interoperability at appropriate echelons
- Smaller units become more lethal / survivable
- Relevant common battlespace picture

Army Digitization of Battlefield

Schedule



Program Status

Key Event	Date
1. Contract Award	1/95
2. First Hardware Deliveries	3/95
3. Warrior Focus AWE	11/95
4. Unit Fielding	2/98
5. MS III Equivalent	3/00

Budget

	Then-Year $, Millions				
	Prior	FY95	FY96	FYDP	Total
RDT&E	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Procurement				[illegible]	[illegible]

Unit Cost History

TBD

The next program here is the Army Digitization of the Battlefield. This effort is a vital part of a whole larger process of redesigning the Army to meet the challenges of the 21st century. This larger process is called Force XXI. It focuses on the underlying concepts and the design, the operational institutional army.

The intent is to enable fewer and smaller contingency forces to be more lethal and survivable in an environment characterized by an accelerated operational tempo demanding instant communications and immediate response times.

The fundamental capabilities here that are required include automated high speed exchange of digitized information, fusion and display of intelligence data to all commanders at all levels, and rapid exchange of targeting data from sensors to shooters, with a near real time picture of the commander's battle space.

To achieve the full benefits of this digitization program, it will be essential that all of the major weapons systems be equipped with the digital capability. While some of our newer weapons systems will have this capability designed in, most do not.

If the Army waits for the normal replacement of weapon systems to drive the introduction of these digital capabilities, it could not realistically be accomplished until well into the 21st century and at a potentially prohibitive cost.

What we are doing instead to achieve a digital capability sooner is through the introduction of what we call applique systems, upgrades to current systems in the field. What we are doing here is applying applique hardware, common application and support software which will meet open system standards and be nonproprietary, except in the most compelling situations.

This will give us a base for future upgrades. In the near term, a series of planned advanced technology demonstrations and advanced concept technology demonstrations will be involved to serve as the technical and doctrinal testing grounds for this digitization effort.

As you can see there, event No. 3, is a warrior-focused army war fighting evaluation. It is brigade size or slightly less to be accomplished with this equipment in November of this year.

Mr. WELDON. Dr. Kaminski, the obvious question is how does this program fit into what you are doing with the BCIS Program that you just described earlier? Why do we have two separate programs? Why should there not be one? How are they being coordinated?

Dr. KAMINSKI. This system provides some nature of that trunk that I was describing, Mr. Chairman, in terms of being able to send information around. One of the advantages of this program is it may give us a much lower cost base rather than simply replicating the BCIS system on every one of our tactical vehicles.

Mr. WELDON. So, you don't see the two necessarily in competition? You see this complementing.

Dr. KAMINSKI. I see this as a more fundamental communications infrastructure and linkage for a variety of data, some of which could include IFF data. I see the BCIS more narrowly as one particular IFF sensor system.

Mr. WELDON. Is there a process of direct coordination between the two?

Dr. KAMINSKI. Yes, there is. Our program of advanced concept technology demonstrations will be doing just that; fielding components here and trying them in exercises.

This IFF bill as important as it is, I share your concern about the importance of the problem. There are so many vehicles to be equipped that we really have to pay very careful attention to the unit cost of those sensor systems and allow for upgrades.

Mr. WELDON. Mr. Kennedy.

Mr. KENNEDY. Would this apply obviously to all of the services? I see it is Army, but it would necessarily need to apply to all of the branches.

Dr. KAMINSKI. You are absolutely right. In fact, one of the issues with the BCIS system is in tests it has worked well on ground to ground. There are more complicated issues in the ground to air environment. This has to be worked across the board.

Mr. KENNEDY. Can you explain for me just as a lay person. I boarded the Mount Whitney which is the command and control ship for the Navy in the operation in Haiti. Would you explain how this would work in a scenario? I am trying to understand. Explain this system.

When you talk about fewer, smaller, rapid, informational linkages, it sounds intriguing and I just don't know how—what is it? Let's get down to brass tacks here. What are we talking about?

Dr. KAMINSKI. What we are talking about here, if you wanted to think about a tank commander having a digital display of where is the adversary? In a common coordinate grid. Where are my own forces under my command? What is the logistics posture of my organization? Who needs to be resupplied first?

It is collecting this information and providing it all together and with some display of the objective, where are we trying to head? Then upward reporting of his situation to his commander who has the benefit of that same situation. It is linking everybody together on the battlefield digitally.

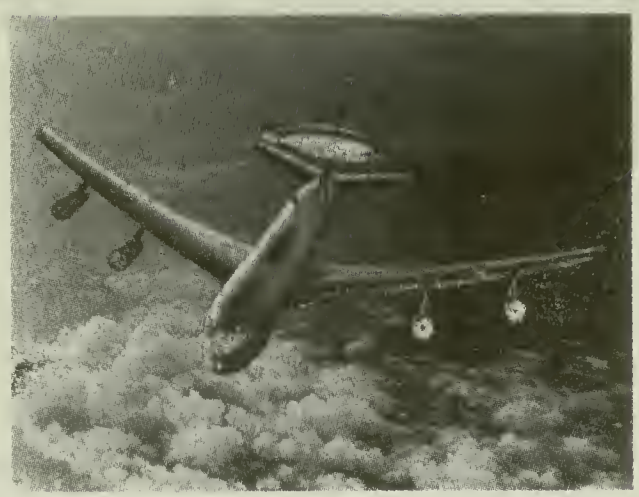
Mr. KENNEDY. It would be interesting for the command and control to see where this gets plugged in, in the hierarchy of command and control.

Dr. KAMINSKI. In fact, that's a major piece of our issue in these war fighting experiments. We will end up fighting in some different ways. The technology is very important. It's probably not the most important, if the most important ends up being how we effectively use this, and that has to be done through experimentation.

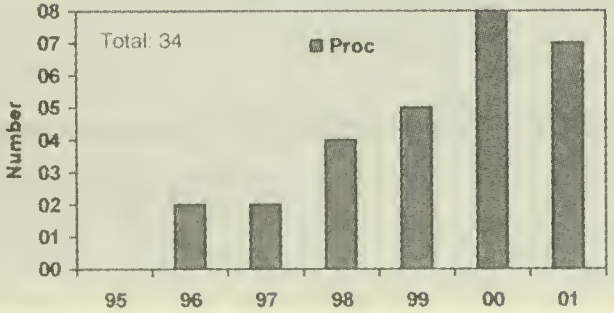
Mr. KENNEDY. Thank you.

Mr. WELDON. I thank the gentleman.

AWACS RSIP



Quantities



Objectives

Development

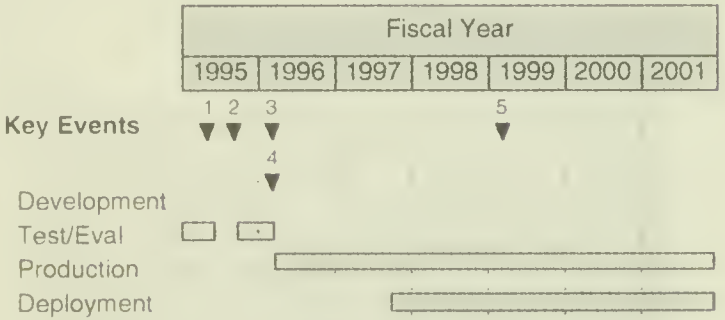
- Maintain range vs smaller cross-section targets
- Improve electronics counter-measures
- Increase reliability/improve maintainability

Operational

- Track cruise missiles/low-observable aircraft
- Operate in presence of jamming
- Increase system availability

AWACS RSIP

Schedule



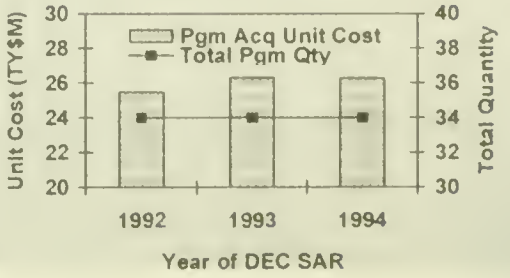
Program Status

Key Event	Date
1. Complete flight test DT&E	03/95
2. Begin flight test IOT&E	07/95
3. Complete flight test IOT&E	12/95
4. LRIP Decision	12/95
5. IOC	1999

Budget

	Then-Year $, Millions				
	Prior	FY95	FY96	FYDP	Total
RDT&E					
Procurement	0				

Unit Cost History



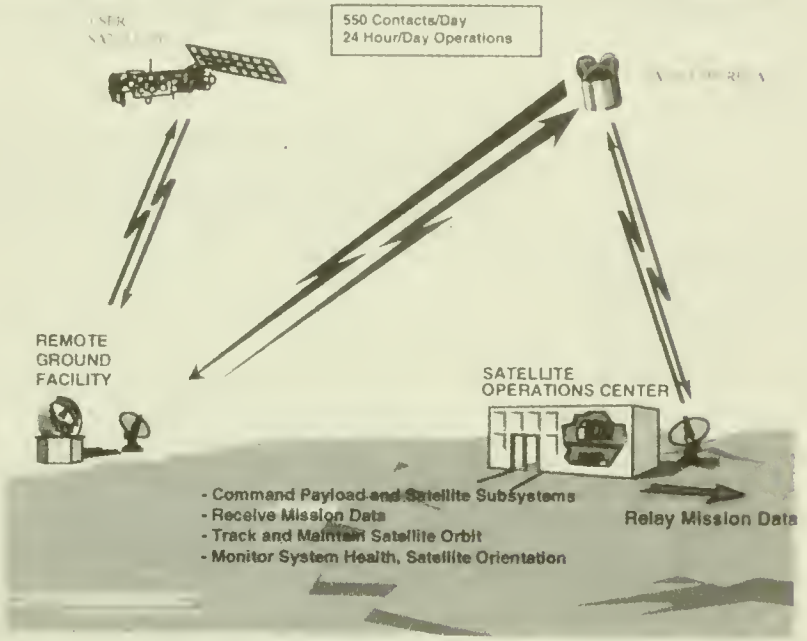
Dr. KAMINSKI. The next program is the AWACS RSIP or AWACS Radar System Improvement Program. This was initiated in 1989 to preserve the long-range capability of AWACS against some of our smaller lower cross section targets like cruise missiles and lower observable aircraft, and at the same time to improve the reliability and the maintainability of the aging radar system.

We experienced about a year's delay in development in this program due to the complexity of the software, but have since surmounted that capability. This RSIP has been developed in cooperation with NATO and the alliance will likely apply similar radar improvements to their whole fleet of 18 AWACS aircraft. We are now negotiating with NATO for cooperation in the production phase.

Mr. WELDON. Dr. Kaminski, my understanding here is that this upgrade would not automatically be made available to the Saudi operation or NATO. It would be available for them to purchase, not our state of the art, but perhaps a lesser system. Is that correct?

Dr. KAMINSKI. That's correct. We still have ahead of us exactly what we would offer to be purchased here.

Satellite Control Network



MISSION: To fly DoD, National, Civil, Allied and RDT&E space systems and support all US launch operations.

OPERATIONS: Provide telemetry, tracking, and commanding (TT&C), communications, mission data dissemination, and data processing support to space systems.

DEVELOPMENT: Modernization of communications and command and control elements will substantially reduce cost of operations & sustainment, enabling standardized operations with fewer, lower skilled personnel.

Satellite Control Network

Program Status

Key Event	Date
• AF/NAVY MOU	Aug 94
• System decision on C^2	Jun 95
• AF-Navy Merger	Jan 96
• Complete Comm Upgrades	FY 01
• Complete C^2 Upgrades	FY 01

Modernization Savings

Total: $ 75 million/yr in O&M (Includes ~600 positions)

- Communications
  - $ 23 million/yr (Includes 215 positions)
- Command & Control
  - $ 34 million/yr (Includes 270 positions)
- Remote Tracking Stations
  - $ 19 million/yr (Includes 91 positions)

Budget ($M/TY)

	FY 95	FY 96	FY 97	FY 98	FY 99	FY 00	FY 01
RDT&E	80.8	89.8	95.4	98.9	112.7	115.5	119.9
Procurement	25.6	25.5	28.1	32.6	37.6	39.5	40.4

The next program is our Air Force satellite control network improvement and modernization effort. This Air Force satellite control network is the largest, most diverse satellite control network in the world.

The modernization is focused on two major areas, command and control upgrades and communications upgrades. The main thrust of the upgrades here is to eliminate nonstandard and insupportable equipment and to replace it with less expensive more capable commercial hardware and software. The current modernization effort is estimated to cost $420 million from fiscal years 1995 through 2001. It will pay off with estimated savings of about $75 million per year beginning in fiscal year 2002 when deployed.

These modernization efforts will also enable additional modernization for our unattended remote tracking station operations resulting in further savings. These efforts were the subject of an intense GAO review during the past year, culminating with support of the Air Force satellite communication network modernization effort.

Mr. WELDON. Dr. Kaminski, we are not familiar with the GAOs recommendations. Were there recommendations that we should use more in the way of the commercially available satellites that are already in place?

Dr. KAMINSKI. Mr. Chairman, this unit here doesn't include commercial satellites. This is the control network for this operation. The GAO's response was generally favorable as to the approach we are taking.

Mr. WELDON. Any questions? Mr. Bateman.

Mr. BATEMAN. Mr. Chairman, might I ask unanimous consent if I could ask a question for the record in view of the fact that I have to leave for another appointment?

Mr. WELDON. Certainly.

Mr. BATEMAN. Dr. Kaminski, I am wondering if you could have someone respond for the record on the status of the new attack submarine and whether or not that submarine will be ready for going to contract in fiscal year 1998?

The indications I have heretofore received of some high level of confidence that, that was the case. Yet, this morning I learned that there has not even been determined the nature of the missile capability that should be built into the new attack submarine.

It seems to me that we are getting to a very late date not to have the design concept at least down pat. Of course, a degree of nervousness that historically, I think it has been something like 16 years between beginning the research on a new class submarine and it's going to contract.

The new attack submarine would be very, very much shorter in time frame than that. Which I hope certainly is do-able. We need to do it. I would like to have not just a conclusionary statement, oh, yes, it is fine; but some analysis of where they are in terms of finalizing the design concept and the capability to execute it.

Dr. KAMINSKI. Mr. Bateman, I will be pleased to do that.

Mr. BATEMAN. Thank you.

[The information referred to follows:]

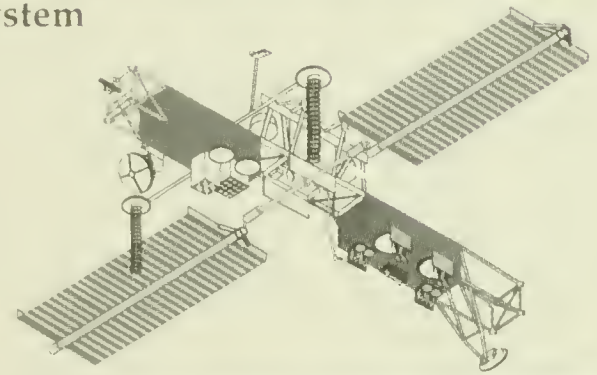
Submarine Program

The major milestones for the New Attack Submarine are defined in the Acquisition Program Baseline and provided in the following table.

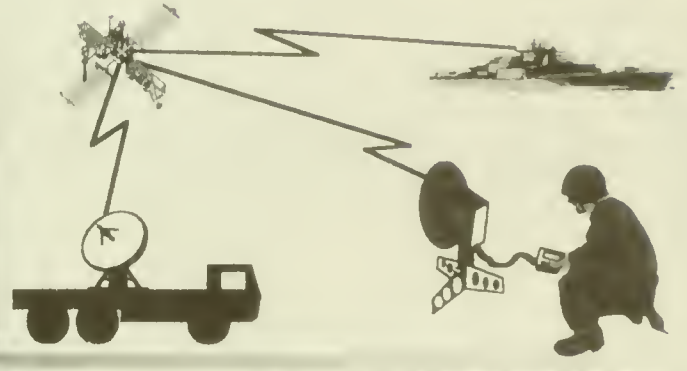
Event	Objective	Threshold	Complete
(U) Milestone 0	Aug 92	Feb 93	Aug 92
(U) Milestone I	Aug 94	Feb 95	Aug 94
(U) Milestone II	Jun 95	Dec 95	
(U) Integrated Product and Process Development Contract Award	Oct 95	Apr 96	
(U) Program Review (LRIP)	Sep 97	Mar 98	
(U) Lead Ship Delivery	Jun 04	Dec 04	
(U) LFT&E Shock Tests	Oct 04	Apr 05	
(U) Initial Operational Test & Evaluation			
Start	Jul 04	Jan 05	
Complete	Oct 04	Apr 05	
(U) Initial Operational Capability (Lead Ship)	Oct 05	Apr 06	
(U) Milestone III	Oct 07	Apr 08	

Milstar

System



Employment Concept



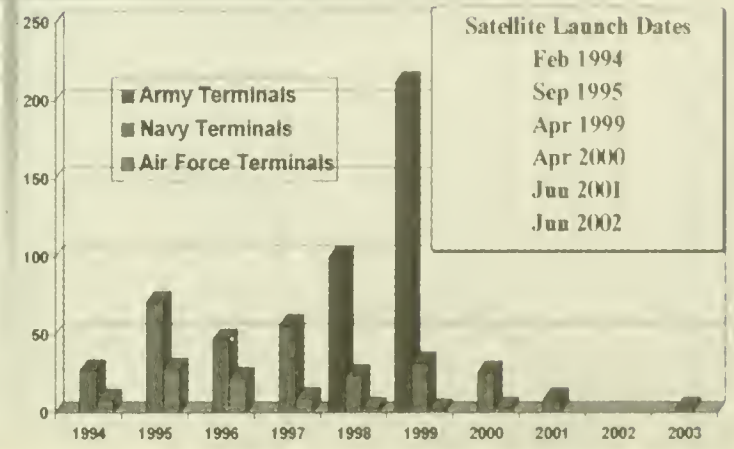
Objectives

Development

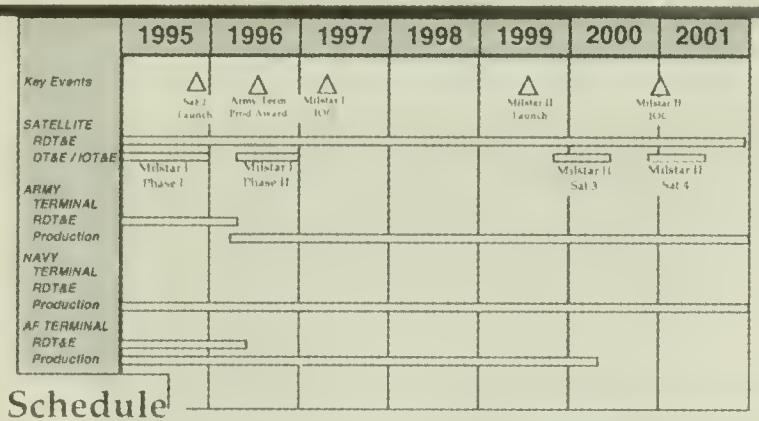
- 1st On-Orbit Processed Payload
- Highly Secure, Robust Waveform
- Provide both Medium Data Rate and Low Data Rate Capabilites

Operational

- Low Probability of Intercept / Detection for all echelons
- Range Extension for Army MSE
- Reconfigurable to Support Changing Operational Scenario



Milstar



Schedule

Program Status - Key Events

2nd Milstar I Launch	Sep 95
Army SMART-T LRIP	Mar 96
Milstar I IOC	Jan 97
1st Milstar II Launch	Apr 99
Milstar II IOC	Oct 00
Milstar II FOC	Dec 04

Budget

	Prior	FY95	FY96	FYDP	Total
RDT&E					
Satellites	5801.1	607.2	649.7	2606.7	9664.7
AF Terminals	1709.0	18.2	42.6	44.1	1826.9
Army Terminals	204.6	26.9	32.1	63.1	336.9
Navy Terminals	333.4	19.8	14.4	116.1	483.7
PROCUREMENT					
Satellites	38.7	0.8	0.9	1.1	41.5
AF Terminals	953.2	13.1	17.9	14.4	998.6
Army Terminals	0.0	0.0	112.3	660.2	849.3
Navy Terminals	666.9	61.5	65.2	502.1	1714.4

Dr. KAMINSKI. Mr. Chairman, the next program is the Milstar Program, the Military Satellite Program planned to provide operational forces, especially our highly mobile tactical units with secure, survivable, flexible communications on a worldwide basis.

The Department restructured the Milstar Program extensively 4 years ago at congressional urging to reduce costs and to account for changes in the international security environment. Requirements for a classified payload were deleted. Some of the heroic survivability features were also eliminated.

The number of satellites and ground station elements were reduced commensurate with the threat and force structure reductions. A higher capability, medium data rate payload is being developed for the second generation Milstar II satellite which expands its tactical utility.

This payload will greatly increase communications capacity with respect to the low rate capability on the initial Milstar I satellites. Use of both the low data rate and the medium data rate will greatly enhance the utility of Milstar II satellites in a wide range of future scenarios.

The restructured program also reduced the number of strategic terminals and defined new mobile terminals for tactical users. It reduced the program life cycle costs by about 25 percent.

The current program, comprised of two Milstar I satellites and four follow-on, Milstar II satellites is the result of extensive analysis during the Bottom-Up Review and it retains solid support from all sectors of DOD.

The first Milstar I satellite was launched last year and has under gone initial testing very successfully. We used a planned break in our testing to support our forces during Operation Restore Democracy in Haiti.

Using prototype terminals we had already deployed, the Army forces on the ground were able to talk directly to deployed command ship and their home base anytime without any independence on terrestrial infrastructure. This satellite now is in final IOT&E.

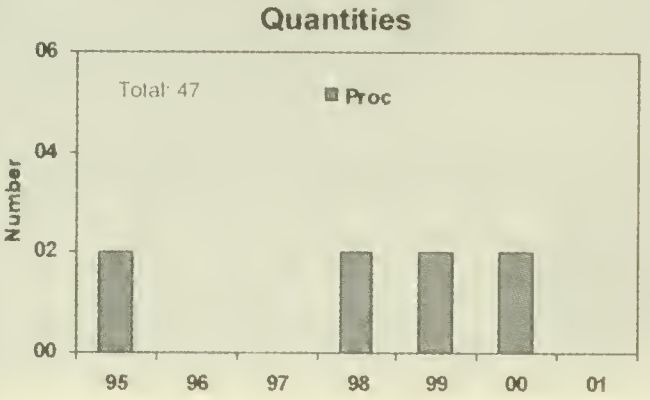
The second satellite is scheduled for launch later this year. Everything looks fine for that approach. We have also completed a successful critical design review on the medium data rate package.

Finally, we have placed the last two Milstar satellites, No. 5 and No. 6, on contract. They are intended to be launched as you can see in April 1999.

Titan IV

Objectives

- Deliver critical National Security Space Programs into their operational orbits
- Titan IVB Provides Common Booster Configuration for all Payloads
- 31,000 lbs to polar orbit and 10,000 lb class to Geosynchonous orbit



Titan IV

TITAN IV

Schedule

	Fiscal Year						
	1995	1996	1997	1998	1999	2000	2001
Planned Launches	5	4	4	2	2	3	3

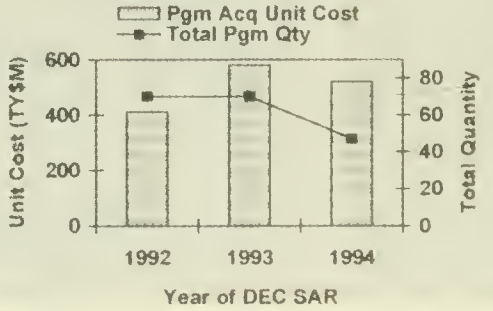
Program Status

Key Event	Date
1. Contract Award	2/85
2. First Titan IV	6/89
3. First Titan IV/Centaur (MILSTAR)	2/94
4. First SRMU	FY96
5. Last Projected Launch	FY11

Budget

	Then-Year $, Millions				
	Prior	FY95	FY96	FYDP	Total
RDT&E					
Procurement					

Unit Cost History



The last program to be discussed today is the Titan IV. We have in place today a program for evolved expendable launch vehicles. Until that program comes on line to support our national user payloads in the year 2005, the Titan IV remains this nation's only capability to place our highest priority heaviest payloads into polar and geosynchronous orbits.

As a result of the Defense Acquisition Board Review last year, the size of this program was reduced from 65 vehicles to 47. I plan to review the strategy for a follow-on by vehicles 42 to 47 later this year.

The Air Force plans to contract an award for the follow-on program in fiscal year 1997. I believe that the additional buy of six vehicles, that is 42 to 47, will be adequate to get us through the transition and the heavy lift version of the EELV program as it comes about in 2005.

I wouldn't like to preserve the option to add additional Titan IV vehicles beyond the six planned as a prudent hedge against the EELV schedule. My intent, however, is to not ever have to execute that option.

Mr. WELDON. Any questions? Is that your final?

Dr. KAMINSKI. That concludes my briefing, Mr. Chairman.

Mr. WELDON. Dr. Kaminski, we will go one final round among the members. I have a couple of items I would like to raise.

Since we have a hearing here at 2 o'clock with the Personnel Subcommittee, I won't belabor the point or ask you to respond necessarily here verbally. If you could for the record, give us an update on what is happening within the Department on the issue of the cooperative research and development agreements.

My understanding is that these have grown dramatically in the last several years to where we now have over 4,800 of these. They were mentioned as a part of the DOE laboratory report. The Galvin Report I think mentioned it. If you could give us an update on that, I would be interested in where we are going with that. I had heard some rumblings at a conference recently that perhaps the Army was not being aggressive in this area as much as perhaps the Navy was. If you could give us a comparison within the services as well.

[The information referred to follows:]

COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENTS

As of May 15, 1995, the Department has a total of 835 Cooperative Research and Development Agreements: 395 Army, 140 Navy, and 300 Air Force.

Mr. WELDON. I have to add for the record in response to an earlier question about the TRP in response to Mrs. Schroeder's comments that there was no pork in the TRP program. Our trusty staff has in fact documented a significant number of cases where member add-ons classified as TRP programs were stuck in.

What happened was that we ended up having our R&D accounts having to pay twice. Not only are we cutting money from R&D programs to establish this TRP process, but member add-ons cause us, in order to keep the process supposedly pure, to take money from other R&D accounts to fund specific programs.

I will provide a list of those for the record which include dual use, critical technology partnerships, the Center for Advanced Control Systems, manufacture of high-performance composites, low-cost

composites, battery technology, the Micro Electronics Extension Service for Industrial Base Conversion, and some regional alliances, including two within my own home State of Pennsylvania.

My point is that this process has happened. That is why I think you are seeing it come under intense scrutiny from both Members of the Senate and the House on both sides of the aisle. Not that it doesn't occur, but that we are taking money away, perhaps from dual use technology operations that are already eligible to be funded through existing authority.

I would insert this in the record of the hearing and just note it because it was discussed earlier.

[The information referred to follows:]

Defense industry and technology case programs

A. Dual Use Critical Technology Partnership:	
1. Battery technology	$7,700,000
2. Low cost composites	8,800,000
3. Center for Advanced Control Systems	3,000,000
4. Applied research and development for commercial shipbuilding	15,000,000
5. Manufacture of high performance composites	5,000,000
B. Commercial-Military Integration Partnerships:	
1. Nanoelectronics	9,000,000
2. Microelectronics extension service for industrial base conversion	10,000,000
3. Electronics manufacturing process improvement	2,000,000
4. Electronics manufacturing	2,800,000
C. Regional Technology Alliances Assistance Program:	
1. Regional rapid prototyping center	500,000
2. Optics/electro-optics	4,931,000
3. Reliability without hermeticity for multi-chip modules	1,320,000
4. Greater Philadelphia Consortium for Science and Technology Education and Training	10,000,000
5. Center for Health Technologies	1,000,000
6. Ben Franklin Partnership and Industrial Resource Center	7,000,000
D. Manufacturing Extension Programs:	
1. Electronics Manufacturing Productivity Facility	6,435,000
2. Life cycle improvement through networking critical technologies	6,000,000
3. Community college association for technology transfer	2,000,000
4. Moline, Illinois Manufacturing Technology Consortium	2,000,000
E. Defense Dual Use Assistance Extension Program:	
1. Image Storage and Retrieval Systems	4,000,000
2. Instrumented factory for gears	8,500,000
3. Product data application protocols for composites	1,275,000
4. Product data application protocols for electronics	1,650,000
5. Modernization of obsolete manufacturing information systems	3,500,000

Source: FY 96 Defense Appropriations Conference Report.

Mr. WELDON. With that, I will yield to the ranking member, Mr. Spratt.

Mr. JONES. Excuse me, Mr. Weldon.

Mr. WELDON. Would you like to respond?

Mr. JONES. Yes.

Mr. WELDON. We have maintained the TRP program itself as a competitive program. There were certainly some member-interest programs that in fact competed and won in the competition under the program. I just add that to complement what you noted.

Mr. WELDON. Mr. Spratt.

Mr. SPRATT. I think one important point to make here is that a lot of the emphasis within our committee for adding conversion programs to the defense budget was just that, conversion.

What you are telling us I think convincingly in your budget here today, presentation here today, is that the long-range consequences of these programs for DOD is that they can, if properly structured, bring down your cost.

Dr. KAMINSKI. Exactly, Mr. Spratt. That's where we are headed long term.

Mr. SPRATT. Thank you very much.

Mr. WELDON. Mr. Kennedy, any closing.

Mr. KENNEDY. No, thank you.

Mr. WELDON. Thank you for sitting through. Mr. Dornan, any final summaries?

Mr. DORNAN. No, none, Mr. Chairman. Thank you.

Mr. WELDON. With that, we would like to thank you for your indulgence. We appreciate you sticking around for 3 hours and answering the questions. It was very informative and very helpful. Once, again, we applaud the role that you have played. We appreciate having you in the position that you are in. Thank you.

Dr. KAMINSKI. Thank you, Mr. Chairman.

Mr. WELDON. The hearing is now adjourned.

[Whereupon, at 1 p.m., the hearing was adjourned.]

[The following information was submitted for the record:]

F/A–18

Mr. WELDON. Do you have any concerns about the contractor's ability to meet the program cost and a first flight schedule of December 1995?

Dr. KAMINSKI. The program is currently on schedule and within the cost ceiling. The program is meeting all its technical objectives. I have confidence that the contractor will be able to meet the first flight schedule, and remain within the cost ceiling for the program.

Mr. WELDON. Production of the F/A–18C/D ends in FY96 and production of the E/F begins in FY97. Do you anticipate any problems regarding the ability of the contractor to make that transition?

Dr. KAMINSKI. I would not anticipate any problems with McDonnell and Northrop Grumman transitioning from production of the C/D to the E/F model. The changes to the configuration are modest, and similar materials, manufacturing methods and processes employed on the C/D will be employed on the E/F.

Mr. WELDON. In view of the relatively limited precision guided munitions capability that will be provided by the F–14 Precision Strike Upgrade and the fact that the F–14 will be the Navy's only deep strike aircraft for at least 18 years after the retirement of the A–6E and until a potential fielding of a new deep strike aircraft around 2015, should a more extensive, more capable upgrade to the F–14 be considered?

Dr. KAMINSKI. The Precision Strike Upgrade for the F–14, coupled with the capability of the F/A–18C, other air wing assets and Tomahawk, will satisfy the needs of battle force commanders during the transition to the F/A–18E/F. The Navy's F–14 Precision Strike Upgrade Program reflects a prudent, cost-effective approach to provide our ten active carrier air wings with those essential upgrades to the F–14 that address necessary survivability, aircraft life, and interoperability, and which provide added precision strike to bridge the period until replaced by the F/A–18E/F.

Mr. WELDON. In view of the Navy's plans for an early retirement of the A–6E in FY97 and your statement that the F–14 Precision Strike Upgrade will not achieve Initial Operational Capability (IOC) until FY00, the Navy will have no long-range, deep strike PGM capability for at least 3 years following retirement of the A–6E. What does this imply with respect to the deep strike role of the aircraft carrier? Should the Navy reconsider its decision to retire the A–6E early?

Dr. KAMINSKI. The Navy is committed to maintaining its long-range precision strike capability through both manned aircraft and Tomahawk cruise missiles. The

F–14 Precision Strike Upgrade Program is one of the ways the Service and Department intend to maintain it. The Navy is currently reviewing a recently-completed F–14 Strike Upgrade Cost and Operational Effectiveness Analysis (COEA) to determine the best precision strike option. Some of the options resident in the COEA include precision strike capabilities with an earlier IOC than FY00, possibly as early as FY97/98. These options will be reviewed during this summer's program review. The Navy's decision to retire the A–6E, as supported by the Bottom-Up Review, is a necessary cost saving measure that provides funding for F–14 multi-mission precision strike capability and other airwing strike upgrades, and does not represent foregoing a deep strike capability.

JAST

Mr. WELDON. Many of the projects being funded within JAST are projects that have been and continue to be funded in other program elements. Please explain the coordination process that exists to ensure unnecessary duplication does not exist between JAST projects and other related non-JAST, Navy and AF projects. Please indicate which projects in Navy and AF program elements where funding was changed or projects reoriented to reflect JAST research and development.

Dr. KAMINSKI. The JAST Program mission is not to develop technologies, but to integrate and demonstrate them to ensure risk and cost are well understood prior to engineering and manufacturing development (E&MD). The JAST Program technology transition investments (demonstrations) are fully integrated with the Service science and technology (S&T) programs. JAST demonstrations depend on the Service 6.3 investments to develop the technology so the JAST Program can use 6.4 funding to demonstrate it. The JAST Program has quarterly meetings with the Service S&T leadership, and includes Service S&T personnel (plus industry, NASA, and, in some cases, National laboratories and professional organizations) on the JAST Program Integrated Product Teams (IPTs) to ensure that projects are complementary and *not duplicative.*

The JAST technology selection process began with the establishment of a technology data base populated through survey of the services and industry. This data base of over 500 project descriptions was used to provide initial insight into those projects most relevant to JAST. Then, as part of its Concept Exploration Phase, the JAST Program, in conjunction with the Weapons Systems Contractors (Boeing, Lockheed, McDonnell Douglas, Northrop Grumman), identified the key leveraging technologies that would reduce life cycle costs. The initial JAST investment strategy was based on these studies.

Congressional cuts to the FY95 Service S&T programs and the accompanying language requesting that JAST absorb part of these efforts, resulted in a revision to the JAST investment strategy. This resulted in the elimination in FY95 of funding for demonstrations of some leveraging technologies that could significantly reduce life cycle cost of a JAST aircraft and restructuring of others. Air Force PEs 63205F and 63216F project efforts for Subsystem Integration Technology and Advanced Power Technology/More Electric Aircraft respectively, were rescoped in conjunction with the JAST Integrated Subsystem Technology to structure an integrated program where the work started in the Air Force project transitioned to JAST. Certain projects in these PEs related to subsystems integration and More Electric Aircraft have been continued by JAST in FY95. However, the objectives of the programs were altered significantly to represent more an integrated system demonstration with participation by all JAST related prime contractors. It should be noted that several other projects continue in these PEs that have relevance to other Air Force programs.

Additionally, Congress requested the integration of the ARPA ASTOVL program into the JAST program. Accordingly, all prior ARPA ASTOVL agreements have been funded by JAST.

To achieve its objective to develop an affordable next generation strike fighter aircraft, the JAST Program will continue to rely on the Service S&T programs to develop technology to the point where it can be matured, demonstrated and integrated.

URGENCY OF COMANCHE

Mr. WELDON. How urgent is the need for the Comanche in view of the fact that Apache-Longbow is coming on line and the Army still has unfulfilled requirements for OH–58Ds? What capabilities does the Comanche bring to the future battlefield that we do not get with these other aircraft?

Dr. KAMINSKI. Due to the existing battlefield inadequacies in the OH–58A/C, AH–1F Cobra, and OH–58D helicopters, armed tactical reconnaissance continues to be

identified as the Army's number one battlefield deficiency. This deficiency is filled by Comanche. The OH–58D is an interim measure to replace Vietnam era aircraft until the Comanche is fielded.

The Comanche and Apache Longbow are complementary combat aviation systems. The Apache Longbow was designed specifically for heavy attack, anti-armor capability within heavy mechanized and armored divisions. Although Comanche possesses an anti-armor capability, the Comanche is designed to perform the armed tactical reconnaissance mission for the maneuver forces (which includes the heavy mechanized and armored divisions). Comanche is best suited for armed tactical reconnaissance and light attack operations in support of early entry contingency forces.

OSD Support for Comanche

Mr. Weldon. In a prior full committee hearing this session, the Army was asked what programs they would advance in fiscal year 1996 if additional funding was provided. The response to the committee did not include the Comanche, which has been touted as the Army's number one priority. What is your view of the support for this program within OSD?

Dr. Kaminski. In testimony by the Secretary of the Army and the Chief of Staff on February 22, 1995, the Chief stated that the Comanche was the number one Army priority. The Department supports the program I approved on March 21, 1995 and will not solicit additional FY 1996 funds for Comanche.

Comanche Versus UAVS

Mr. Weldon. There was a recent media report that you requested an analysis comparing the Comanche helicopter and Unmanned Aerial Vehicles. Can you give us your thoughts on what you have in mind?

Dr. Kaminski. Comanche and Unmanned Aerial Vehicles (UAV) are systems with different capabilities. My intent for the Milestone II decision is to have an analysis of Comanche in combination with UAVs (and other assets) to assess the military worth to the Army as well as in the joint arena.

Deep Battle

Mr. Weldon. As tight as the acquisition budget is, does it make sense to have as many weapons in development that typically achieve the same warfare results, i.e. kill tanks and artillery?

Dr. Kaminski. The military departments wage conventional warfare in a balanced manner, under many different conditions and against many different targets. One important area where the military departments have complementary weapons capability is in the deep battle mission. Specific variables include the need to conduct operations in all weather, day/night conditions, against threats which range from stationary, soft to moving, hard targets, from various launch platforms—indirect fire, rotary wing and fixed wing assets, and against a variety of countermeasures. For these reasons, the Department must have available a suite of weapons to allow the most flexible response.

However, in order to assure that the Department is developing the optimum mix, the Office of Program Analysis and Evaluation in the Office of the Secretary of Defense, with the military departments' participation, is conducting a mission area assessment of our anti-armor weapons. This assessment includes both developmental and production systems. The initial results are expected in June 1995; final results will be one year later.

Relative to your concern as to overall affordability of our deep strike weapons, please bear in mind that the Department has significantly reduced the procurement of these weapons consistent with the diminished threat.

Mr. Weldon. Can the Congress expect this to be resolved in the roles and Mission assessment?

Dr. Kaminski. It is unlikely that the Roles and Missions assessment will have sufficient fidelity to allow an assessment of the optimum mix of weapons needed to perform the deep battle mission. The appropriate mechanism to allow this determination is the Office of Program Analysis and Evaluation-led, with the military departments' participation, mission area assessment. The ongoing Joint Warfare Capabilities Assessment and the continuous reviews of the Joint Requirements Oversight Council are two additional forum to assess the mix of the deep battle weapons.

V–22—Measures to Lower Unit Cost

Mr. Weldon. Some have raised concern about the relatively high unit cost of the V–22. What measures are being considered that would lower the unit cost of the aircraft? What could be achieved by increasing the annual production rate and fielding the required number of aircraft over a shorter period of time that is currently envisioned?

Dr. Kaminski. The Defense Science Board has recently reviewed cost reduction strategies for the V–22 and has considered various approaches including multiyear procurements, reduced government oversight, using a more "commercial approach" and investment in cost reduction activities. We expect savings from these approaches as they are implemented.

Another approach to reduce unit cost would be to increase the production rate as you point out. Unfortunately, affordability within the overall DoD budget is the predominant factor in determining the production rate.

Current plans call for achieving a maximum rate of 22 MV–22s in FY 2009 per year with yearly expenditure of approximately $1 B in FY 1994 constant dollars. If the rate was increased to 36 per year, the Navy calculated that the Marine Corps objective of 425 aircraft would be delivered 10 years earlier in 2013 at a savings of $4.9B but yearly expenditure would nearly double.

Impact of $100M Reduction in V–22 Program

Mr. Weldon. What has been the impact of the reduction of approximately $100M in the V–22 program made by the Congress over the past two budget requests? Do you have any concerns about any increased risk in the program as a result of such reductions?

Dr. Kaminski. In order to maintain program schedule, the program office has been forced to delay a number of support related requirements, cancel risk reduction flight testing (including shutdown of aircraft #2 flight testing), and decrease program oversight. During FY 1996 budget deliberations, funding was restored in the later years of the Future Years Defense Program to allow replanning of these events. Although the overall risk of this replanning is manageable, any additional near-term funding reduction could significantly increase program risk and negatively impact the integrated MV–22 and CV–22 (Special Operations Command variant) program schedule.

Digitization

Mr. Weldon. The electronics industry is providing advanced information systems to the commercial marketplace approximately every 12 to 18 months, but the services in their acquisition process typically deliver new hardware to the field every 12 to 18 years! How do you ensure that our fielded technology now and in the future will not be obsolete?

Dr. Kaminski. The Army's technical architecture is predicated on the disciplined use of non-proprietary, open, and commercially accepted standards and products. Adherence to the architectural rules will enable the Army to upgrade hardware and software with minimal impact. The Director of the Army Digitization Office has the responsibility for enforcing the technical architecture. The applique contract also contains a technology insertion clause that will enable us to upgrade computer processors and peripherals as they become commercially available.

Mr. Weldon. It has been estimated that we spend about $40 B annually on Command and Control hardware, software and operations. In addition we are continually modernizing to provide greater capability (digitization). What management and oversight does OSD have to ensure interoperability, compatibility of architecture standards, and necessity and sufficiency of information users?

Dr. Kaminski. The Department has selected a migration system for command and control at the strategic level known as the Global Command and Control System (GCCS). The most important feature of this system is the Common Operating Environment (COE) which provides reusable software modules supporting common protocols, standards, user interfaces, and data exchanges for all services thus ensuring interoperability and compatibility. Lower level command and control systems are also migrating to COE modules.

In addition to the normal oversight reviews for programs which are considered Major Defense Acquisition Programs, joint service interoperability is addressed by the Military Communications and Electronics Board (MCEB) operated by the Joint Staff. The Defense Information Systems Agency (DISA) reviews all command, control, and communications (C3) related Requests for Proposals (RFPs) for compliance with DoD standards and architectures, such as the Technical Architecture Frame-

work for Information Management (TAFIM). DISA's Center for Standards assists with the implementation of standard data elements through the support of a joint Data Standardization Task Force for C3 systems.

The services have also entered into Memorandum of Agreements (MOAs) with each other regarding coordination of their C4 digitization efforts. As software and hardware are available, the services are conducting Advanced Warfighting Demonstrations (AWD) and Advanced Warfighting Experiments (AWE). For example, in FY 1997 the Army will conduct Task Force XXI, an AWE, with Marine Corps and Air Force participation. These experiments involve actual users (soldiers) with actual battlefield equipment and are critical to assessing the necessity and sufficiency of the information on the battlefield. In addition, these experiments will be observed by members of the independent test community.

Mr. WELDON. How does the Battlefield Combat Identification System (BCIS/"BEE-cis") integrate into the digitization effort? What support are you giving to the BCIS program?

Dr. KAMINSKI. The BCIS is one of the three Army Horizontal Technology Integration programs, along with Battlefield Digitization, and Second Generation Forward-Looking Infrared (FLIR). BCIS outputs are integrated with the digitization programs to help provide situational awareness across the battlefield. BCIS will participate in Task Force XXI. BCIS has a comprehensive technical and operational test program, which is separate and apart from the digitization program. BCIS developmental testing to date has been very successful and the Pre-Production Qualification Test (PPQT) program is scheduled later this year. The subsequent Limited User Test (LUT) will provide initial insight into the effectiveness of BCIS in its operational environment. We are currently exploring structuring the Task Force XXI experiment as an operational test before the 1997 BCIS production decision.

GLOBAL POSITIONING SYSTEM (GPS)

Mr. WELDON. What efforts does the department have underway to ensure that its growing dependence on GPS does not become an "Achilles heel" for our forces?

Dr. KAMINSKI. Over the last several months, the Department has initiated several actions across the Services and operational commands to broaden awareness of the complete tactical environment within which GPS will be used. The purpose of these actions is to prevent the concern expressed in this question from becoming a reality. Awareness of GPS military utility grew dramatically after Desert Storm, but was initially focused on operational benefits to be derived from direct use of the system by U.S. and allied forces. Protection of GPS use and denial of use to adversaries are also components of the GPS environment which are now receiving attention. Military GPS equipment is becoming available at the operational unit level in sufficient quantities to permit GPS to be fully incorporated in joint exercises. This will be necessary to support development of a GPS operations concept encompassing the full spectrum of GPS tactical employment by U.S. and allied forces and, potentially, by adversaries.

Mr. WELDON. How can we ensure that GPS will not be used by a potential enemy to target our own forces?

Dr. KAMINSKI. To the extent GPS signals are available for peaceful civilian use around the world, they will also be available for hostile military exploitation. This reality is the basis for consistent employment by the DoD of GPS security features called Selective Availability and Anti-Spoofing (SA and A–S). The SA feature degrades the accuracy directly available from GPS for commercial civilian receivers to a peacetime level set by policy to be no worse than 100 meters. The level of SA degradation may be increased further by decision of the President. Military GPS receivers are unaffected by SA degradation. The A–S feature provides an encrypted signal which may only be received by GPS users with keyed military receivers. Though they are separate features, SA and A–S are operated together to provide a military competitive advantage for U.S. and allied forces.

COMMUNICATIONS SATELLITES

Mr. WELDON. It would seem that if there is any place that the department could save money in dual use technologies it would be in the area of communications satellites. Why can't the military make greater use of the current and emerging commercial communications satellite capability?

Dr. KAMINSKI. As the world in general, and the DoD in particular, move forward into the information age, the need to move large amounts of data around the world increases. There has been a substantial increase in the ability of both the terrestrial infrastructure, especially fiber optics, and commercial satellite communications

(satcom) to meet that demand. As in the past, the DoD continues to make use of these commercially available services to the maximum extent practical.

Unforunately, commercial satcom services cannot economically meet the full DoD need. The DoD contracts for satcom services through a central office (Defense Information Technology Contracting Office [DITCO]) but the costs are still rather high, and can quickly deplete scarce operations dollars. For example, during the first two weeks of operation in Haiti, the DoD usage of the International Maritime Satellite (INMARSAT) jumped by over 100,000 minutes at a cost of $6.25 per minute. And that usage was in addition to the normal 200,000 minute per month INMARSAT background. That background rate translates to $15,000,000 per year, a sizable bill for an extremely limited satcom resource.

Added to these fiscal considerations are operational concerns such as the lack of DoD network control (e.g. to prioritize users), limited jam resistance, need to negotiate signal "landing rights", operations at frequencies incompatible with other military terminals, and increased competition with other commercial user for the same channels. Given these constraints, it is unwise to believe that commercial satcom can satisfy all of the DoD requirement. The US must have assured access to suitable satellite communications capacity when and where it is needed, anywhere in the world. Although commercial communications can provide an important and useful adjunct to this capability, DoD can not depend on it solely since there will be multiple circumstances where its use could be delayed or denied for political or business purposes. Therefore, DoD owned systems are needed which reserve their capacity to provide assured access services to the deployed warfighter.

On the other hand, there are opportunities to make better use of these capabilities where it makes fiscal and operational sense. The DoD has recently embarked upon a course, under the Commercial Satellite Communications Initiative, to do just that. As a result of a two year study, the DoD is poised to create its own network through the lease of commercial transponders. Contracting directly with the transponder owner, DoD can then establish its own commercial net, over which it retains operational control. While other commercial shortcomings remain, this innovative approach allows the commander the ability to tailor his commercial net to best suit changing conditions, off-load lower priority users, and manage his commercial/military traffic to the best operational advantage. If this initiative succeeds, the DoD can expect greater access to commercial communications capacity at reduced cost with an increased ability to control the operational use of those resources.

Mr. WELDON. What is the status of the satellite communications master plan directed in last year's Defense Authorization Act?

Dr. KAMINSKI. In response to the direction contained in the 1995 Authorization Act, the Office of the Assistant Secretary of Defense, Command, Control, Communications, and Intelligence convened a department wide study to develop the requested master plan. The study, which ran from September through February, included an investigation of the total set of future requirements for satellite communications, an assessment of current and planned communications satellites, both military and commercial, and an evaluation of a variety of satellite communications architectural constructs. The evaluation examined not just the space-based portions of the architectures, but the ground-based portions as well.

The results of this study have now been documented in the requested master plan, and that plan is currently in coordination. We anticipate delivering to Congress early this summer. However, we have not stopped there. As a direct result of the process to develop the plan, we are now engaged in a follow-on architecture study which is intended to develop the future architecture for the next generation of all military communications satellite systems. We hope to have that completed in early summer to support programming decisions later this year.

SPACE MANAGEMENT

Mr. WELDON. Regarding the new Under Secretary of Defense for Space, will this person have sufficient authority to direct changes he seems necessary to achieve "convergence," to use your term, among the services, NSA, and NRO space programs?

Dr. KAMINSKI. The new Under Secretary of Defense for Space, DUSD (Space), will consolidate in a single organization all existing OSD space policy and acquisition responsibilities. The DUSD (Space) will be the DoD focal point for all matters relating to space. Included in the responsibilities and functions of the DUSD (Space) is oversight of implemention of Joint Space Management Board policies and decisions and acquisition oversight of DoD space programs. The Joint Space Management Board (JSMB) is envisioned to be a "board of directors" for all DoD and National Security Space programs with specific representation from the DCI, SECDEF, and CICS. The

DUSD (Space) will report to the Under Secretary of Defense (Acquisition and Technology). The space policy, architecture, and acquisition responsibilities will give DUSD (Space) authority to oversee execution of all space acquisition by Services and Defense Agencies.

Integrated High Payoff Rocket Propulsion Technology (IHPRPT) Program

Mr. Weldon. The Air Force has been working on new rocket propulsion technologies through the Integrated High Payoff Rocket Propulsion Technology program. How will this program focus the national rocket propulsion effort and maximize the national investment in this important technology area?

Dr. Kaminski. The IHPRPT program focuses the national rocket propulsion technology effort by means of clear, measurable, time-phased technology goals that have large system-level payoffs. These goals have been endorsed by all the participants—Army, Navy, Air Force, NASA and all of the rocket propulsion manufacturers. Each of the manufacturers has submitted a first draft of a plan to achieve the goals in their areas of interest, and we have also formulated the first draft of a government plan to achieve all of these goals.

IHPRPT will maximize the return on the national investment in this area by: focusing all technology investment, including industry IR&D, on achieving these high-payoff goals; providing stability by means of unchanging goals; and providing for integrated efforts which maximize the leverage of the investments of all participants.

Advanced Concept Technology Demonstrations (ACTDs)

Mr. Weldon. A concern exists that successful ACTD's, such as the Tier II UAV, could result in the government procuring systems for operational use for which logistics supportability and associated costs have not been adequately established. This could result in operations not being supported because of inadequate spares and/or government having to depend on the system contractor for logistics support. How does the department plan to address logistics requirements to insure supportability and reasonable costs for ACTD systems' logistics support?

Dr. Kaminski. First, each ACTD is required to have within its budget specific funds allocated to sustainment of the system during the two years or so of field testing that occurs within the ACTD. In addition, planning for supportability after successful completion of an ACTD is a subject that is receiving a considerable level of attention. A supportability Working Group was established in late FY94 to review the initial set of ACTDs from a supportability perspective and to make recommendations for changes, or additions to address any supportability issues. That working group has conducted an initial review of those ACTDs that could contain the most demanding supportability requirements and specific issues have been identified and are now being addressed.

With regard to the Tier II UAV specifically, the 10 air vehicles and 3 ground stations currently funded in the ACTD are adequately supported through the POM using contractor support. The air vehicle and ground station designs emphasize commercially available sub-systems that would keep the overall system affordable, supportable and unclassified. As a result the electro-optical and infrared cameras, engine, data links, communications, and many ground station components are commercial products or common to other military systems. If the Department decides to acquire additional Tier II systems the logistics and supportability options (government or contractor support) will be explored to find the most cost effective alternative.

To address supportability considerations in future ACTDs, we are adopting a planning approach that is based on an integrated product and process development (IPPD) approach. This will involve active participation by representatives from relevant areas, such as supportability, as members of an integrated team that is empowered with the responsibility for the ACTD design, development, and demonstration effort as well as for planning the transition to the next phase of development or to the warfighter. For those ACTDs that will transition into the acquisition process for further development, the IPPDs must generate lessons learned and feed that information into the next phase. For ACTD's that will feed directly to the warfighter, the IPPDs must provide sufficient influence on the design and planning to insure supportability after the transition.

DoD S&T Funding

Mr. Weldon. Overall DoD S&T funding has steadily decreased over the past few years. What do you see as the major impact of this funding decline to military readi-

ness and the development of future technologies to maintain America's military technological superiority?

Dr. KAMINSKI. The decrease you refer to in the Science and Technology (S&T) program is the result of the need to reduce overall DoD funding. We recognize the importance of investing in S&T in order to maintain our military technological superiority and provide the capabilities needed to permit early and decisive victory in any form of conflict. We have and will continue to maintain S&T funding at the levels necessary to protect the future. We have made significant improvements in our S&T program management and were able to accommodate these reductions without impacting critical efforts.

Mr. WELDON. DoD S&T funding has shifted away from the services to OSD and the defense agencies. Is this shift part of a larger strategy or by coincidence? Are the services losing too much control of programs? How are the decisions being made that affect the shifts?

Dr. KAMINSKI. I do not believe Science and Technology (S&T) funding has shifted away from the Services, in fact, in constant dollars the Service's S&T funding has remained fairly constant since FY 1991. The increase in ARPA and OSD did not come at the expense of the Services but were at the result of Congressional increases most notably in the Technology Reinvestment Project and increases in the medical programs. It is also important to note that the OSD and Agency efforts are closely coordinated with the Services who, in most cases, are assigned responsibility for program execution.

TECHNOLOGY AREA FUNDING

Mr. WELDON. How does OSD and the services decide what technology areas to fund? What specifically are those technology areas and how much funding is allocated to each? (Please show for FY 93 through the FYDP, by PE)

Dr. KAMINISKI. The funding required for Science and Technology is driven by the military capabilities that will be needed to maintain our technological superiority, to reduce costs (of acquisition and ownership), and to improve our readiness posture through improved training, testing and tactics development. These needs are documented in the Defense Science and Technology Strategy that was developed by DDR&E working with the Services, Agencies and Joint Staff. The Services and Agencies, under DDR&E leadership, developed the Defense Technology Plan, which is responsive to the Strategy. The Plan, which was published and distributed to Congress, the Services, industry, etc., in September 1994, is based on nineteen separate technology areas for which goals, funding, milestones and other programmatic characteristics are identified.

CRITERIA FOR MILITARY RELEVANCE

Mr. WELDON. In the past, DoD has been directed to fund technologies that have no direct military relevance. What criteria does DoD use to determine direct military relevance or primary military relevance in making decisions on which dual use programs to fund?

Dr. KAMINSKI. The Department's research and development programs are selected on the basis of their contribution to National Security. Some of these research efforts are labeled "dual use" because they have relevance to non-DoD applications, or apply commercially developed technologies to meet Defense requirements. These dual use programs enable the Department to leverage commercial research and development efforts, and realize cost efficiencies by satisfying military requirements in conjunction with commercial production. The Department screens its dual use programs during the budget progress to ensure funding for those programs that offer solutions to the military requirements.

TECHNOLOGY REINVESTMENT PROJECT AND SECTION 2371

Mr. WELDON. In your statement you say that if you didn't have TRP you would have to invent it. Given the Title 10 authority (sec 2371) that pre-dates TRP that provides "special agreements" authority—government, industry, academia partnerships and cost sharing—for ARPA as well as the military services, it would seem TRP is redundant, simply creating yet another dual use "process." What does TRP do that cannot be accomplished by section 2371? What couldn't you do as far as conducting cost-shared, partnership technology programs that you do now through TRP if section 2491 through section 2423, under which TRP exists, were deleted from the legislation?

Dr. KAMINSKI. The basic authority of 10 U.S.C. 2371 is, indeed, fully adequate to enter into cost-shared, pre-competitive consortia arrangements and thus would

allow for a TRP-like program. In FY 1991 and FY 1992, Congress appropriated funds for pre-competitive consortia and dual use, critical technology partnerships, respectively. These programs had many similarities to TRP's technology development projects but did not require consortia and partnerships of specific composition or specific cost sharing.

These precursors to the TRP reinforced and expanded ARPA's dual use expertise, but, unfortunately, this expertise tended to remain isolated inside of ARPA. Today, the TRP is the key to spreading this dual use strategy throughout the DoD. First, it is clear signal to both the industrial community and even our own employees that the DoD is serious about new ways of doing business. Second, bringing together the Army, Navy, AF, and ARPA lets the TRP focus on technologies of interest to multiple services. Third, by changing technology focus areas over time and executing projects through the military services, the TRP is building a cadre of service people steeped in dual-use management and is transferring dual use procedures into the Services. Thus, the TRP is catalyzing real, "nuts and bolts" change in the R&D methods of all of DoD's branches, something that is not easy to do. This is the most important, unique benefit of the TRP, because having permission to do something is not the same as having enough knowledgeable people and procedures to get it done. I would have to invent TRP if we didn't have it because the DoD cannot get all these benefits without having an integrated dual use R&D program with sufficient critical mass—which is the TRP.

ARPA Funding Increasing

Mr. Weldon. Funding for ARPA has increased 75 percent over three years, most of it associated with dual use technologies and programs. Is this appropriate given the level of cuts in other military programs? How do you determine the level of effort that should be applied to dual use programs as compared to military programs?

Dr. Kaminski. Between FY 1992 and FY 1996, ARPA's program increased by 65 percent. The increase reflects ARPA funding of National initiatives such as the Federal High Performance Computing and High Definition Systems programs, transfers within DoD of the Balanced Technology and Air Defense Initiatives, and the Technology Reinvestment Project, as well as a number of unrequested congressional adds. The majority of this growth occurred in the FY 1992–94 timeframe. Since FY 1994, ARPA's budget has remained stable and the dual use component of the ARPA program increased by approximately $50 million, or 3.5 percent. In real terms, the increase in the dual use program between FY 1994 to FY 1996 was insufficient to offset the effects of inflation, resulting in negative real growth during the period.

ARPA has pursued research in areas that can be classified as "dual use" from the Agency's inception. The high risk, high payoff advanced research it sponsors often has non-DoD applications, but more importantly, constitutes the building blocks that will maintain our military superiority well into the future. Historically, science and technology funding, of which ARPA's budget is but one component, has only grown to accommodate inflationary trends. The Department has remained committed to this research funding in recognition that a strong research program both expands the capability of U.S. forces and precludes technological breakout by current or potential adversaries.

TRP and Defense Conversion

Mr. Weldon. Up until this year, the Administration heralded TRP as a defense conversion program. The section of the law that establishes the program is called "National Defense Technology and Industrial Base Defense Reinvestment and Defense Conversion." Yet, this year, ARPA, the White House, and everyone involved with running the program tells us that TRP has nothing to do with defense conversion. For the last three years the TRP advocates were selling the program based on converting defense companies to civilian production—called "spin off." In this year's "spin," we are "spin on,"—in what could be called "commercial conversion," taking commercial products and converting them or adapting them for military use. What has changed that now the program is being advocated as "spin on" instead of a defense conversion program?

Dr. Kaminski. The term "defense conversion" was often used as short-hand to refer to those programs initially funded under the act that you cite, which did include programs to retrain military members affected by the Defense downsizing, help for communities affected by base closures, as well as technology reinvestment efforts such as the TRP. But the TRP, itself, is focused only on the development and preservation of critical defense technology and not defense conversion.

We believe that it is seldom feasible to convert major Defense contractors from producing large military end-use products to producing civilian end-use products.

Even where it is feasible, the decision to try belongs with the company only, not the government and certainly not the TRP.

The purpose of the TRP is to leverage commercial technologies and manufacturing processes to the benefit of the military. From the outset it has focused on leveraging commercial know-how and investments for military applications ("spin-on") and finding new commercial markets for existing defense technologies to lower their price ("Spin-off"). We can no longer maintain separate defense and commercial industrial bases. Leveraging the know-how and investments of commercial industry for military applications is mandatory, not optional, and that is what the TRP is all about.

Science and Technology

Mr. Weldon. Why do you believe the services have been so slow to put the special agreements authority under section 2371 of Title 10, into practice?

Dr. Kaminski. I'd describe the Military Departments' approach as deliberate and thoughtful, rather than slow. We're all working together to make positive changes in the way DoD carriers out its research business.

Toward that end, we're exploring how to use appropriately the authority in sections 2358 and 2371 of Title 10, to carry out research projects through cooperative agreements and "other nonprocurement transactions." The Military Departments' emphasis this past year, the first year they had the authority, was on crafting cooperative agreements that reduced unnecessary government intrusions on commercial organizations' business practices. Their efforts complemented those of the Advanced Research Projects Agency, which has used the authority for a few years to experiment with other nonprocuement transactions.

Given the potential power of the authority, a reasonable amount of deliberation and thoughtfulness on the part of the Military Departments is a virture—it should not be misconstrued as a lack of interest or commitment to needed cultural change.

DoD Dual Use and Cost Shared Programs

Mr. Weldon. Please provide a listing of all DoD dual use, cost shared programs, including participants, other than TRP, identified by service or agency.

Dr. Kaminski. I previously indicated that we do not have a data base which captures "dual use/cost shared" projects, but promised you a final response as soon as we could gather the information. A data base, Defense Technology Transfer Information System (DTTIS), has been established using the Technology Transfer Working Group (TTWG), which is composed of representatives from the Services, the Defense Nuclear Agency, the Ballistic Missile Defense Organization, and the Advanced Research Projects Agency, in cooperation with the Defense Technical Information Center.

From assessing DoD resources, several projects have been identified as "dual-use, cost shared other than TRP." These are attached.

COST SHARED DUAL USE PROJECTS—FISCAL YEAR 1995; TRP PROJECTS ARE NOT INCLUDED

[In thousands of dollars]

Project	Service laboratory	Contractors	Federal	Non-Federal	Total funds
Integrated Helicopter Design Tools	Army AATC	Bell Helicopter, Textron, McDonnell Doug	800	849	1 649
New Approaches to Food Packaging, Preservation and Preparation	Army Natick	Purepulse Technologies, Tetra-Pax Rsrch	557	617	1.174
Digital Cable Test System	Navy ONR/NUWC	DIT–MCD, Laurel Technologies	800	800	1 600
Commercialization of Weapons Team Engagement and Training Tech	Navy ONR/NAWCTD	SBS Technol, Camber Corp	800	800	1.600
DNA Immunization	Navy ONR/NMRI	VICAL, Connaught Labs	800	800	1.600
Newport News Shipbuilding Conversion to World Class Shipbuilding	Naval Surface Warfare Center.	Newport News Shipbuilding & Drydock	3 200	3.200	6 400
Heterojunction Bipolar Transistor Fabrication Program	Air Force Wright	Westinghouse Elect, Epitronics	795	800	1 595
Speaker Identification for Law Enforcement	Air Force Rome	Dictaphone, Speakez, Rutgers	800	800	1.600
Wide Area Surveillance Thermal Imagery	Air Force Hanscom	Texas Instruments, Litton	800	800	1.600
Metal Object Identification For Improved Security Systems	Air Force Phillips	EG&G MSI, Farr Research	800	800	1 600
Adv NDI for Agile Manufacturing	Air Force Wright	Adv Resrch	1.360	1.712	3 072
Flexible Fabrication w/Superconduct	Air Force Wright	Boeing	65	550	615
Testing Strategy for Mixed Signal Modules	Air Force Wright	Boeing	945	1 247	2 192
RTM Rapat Technology	Air Force Wright	Dow/United Tech	2.041	2.041	4.082
Affordable Welding	Air Force Wright	Dupont	2.000	2.051	4.051
Engine Supplier Base	Air Force Wright	Howmet	200	5.281	5.481
Agile Infrastructure for Manuf	Air Force Wright	Lockheed	8 238	8.328	16.476
Parallel Algebraic Logic	Air Force Wright	Martin	1 450	5.456	6.906
Affordable Tooling for Prototyping	Air Force Wright	McDonnell	4.331	5.685	10.016
Fiber Reinf Mullite Matrix Comp	Air Force Wright	Minnesota Mining	2.140	2.140	4 280
Modular Factory for EW Components	Air Force Wright	Northrup	100	2.071	2.171
Decision for Mgt of Agile Supply	Air Force Wright	Philips Elec	140	180	320
Decision for Mgt of Agile Supply (Funding Action and Option Exercise)	Air Force Wright	Philips Electronics	845	1.261	2 106
Adv Materials Partnership, Pultrusion	Air Force Wright	Rockwell	1.900	3.904	5.804
Ecoboard, Green Printed Circuit Boards	Air Force Wright	SAIC	1 274	347	1 621
Smart Mat'l for Rotor Blade	Air Force AFOSR	Smart Structures	609	2.245	2 854
Advanced Motor Drives	Air Force Wright	Sunstrand	100	2.020	2 120
ESM Radar Miniature Digit Rcvr	Air Force Wright	Westinghouse	95	2.000	2 095
Agile Business Practices	Air Force Wright	Automotive Indus Group	1.000	2.555	3.555
Qual Criteria Agile Enterprises	Air Force Wright	Consort Adv Manuf	706	789	1.495
Fluxless No Clean Solder	Air Force Wright	MCNC Resrch Triangle	1.880	2.109	3 989
Natl Center for Indust Compet	Air Force Wright	Natl Ctr Indus Cmp	3.500	3 500	7.000
Aluminum Nitride Electronic Packaging	Air Force Wright	Carborundum Company	4.410	5.359	9.769

Object Technology for Rapid Software	Air Force Rome Lab	Template Software, Inc	5.898	5.005	10.903
Totals			55.379	78.012	133.391

Personnel Reductions

Mr. Weldon. In April 1994, The Defense Science Board recommended that the services reduce laboratory personnel levels by 40 percent over the next five years. However, a preliminary review of past and current BRAC actions indicates that total lab personnel will shrink by about eight to ten percent, much of it associated with force reduction, rather than separate BRAC reductions. Has OSD "endorsed" the DSB's recommendation and if so, has your office recommended to the services that they develop future lab personnel plans to reflect this recommendation? If not, how [w]ill additional personnel reductions be achieved?

Dr. Kaminski. While we agree with most of the recommendations of the DSB, the Department did not set specific targets for the services to meet in BRAC. However, full-time equivalent (FTE) allocations, as reinforced by the Defense Planning Guidance (DPG), will result in 35% reductions by 2001.

BRAC Characterization

Mr. Weldon. As a follow up to the preceding question, it appears that 95 percent of all the lab personnel reduction that emerged from the BRAC process came out of the Navy. While the Navy has had the largest laboratory infrastructure, how do you account for such a disparity?

Dr. Kaminski. BRAC 95 is the first effort by the Department to emphasize cross-service consolidations. Five groups were established to develop closure and realignment alternatives in common support functions. Each group developed excess capacity reduction goals; established data collection procedures and milestone schedules for cross-service analysis of common support functions; and presented alternatives to the Military Departments for their consideration in developing recommendations. All of the groups were successful in identifying excess capacity and alternatives that would consolidate workload across the Services. However, as the Military Departments considered these alternatives they attempted to balance functional consolidation with individual Military Department strategies for basing their forces. They found cross-service alternatives more costly or otherwise less supportive of their objectives than in-service ones.

As for laboratory infrastructure, each of the Military Departments have developed strategies to reduce the size of their lab infrastructure. These may involve force structure reductions rather than BRAC reductions. As Secretary Perry stated in his February 28, 1995, letter forwarding his BRAC 95 recommendations to the Defense Base Closure and Realignment Commission, "Overall, the cross-service effort did assist in reducing capacity and determining where joint or collocated functions made functional or economic sense. Further, this DoD-wide review of support functions provides a road map for cross-servicing in the future."

Service Efforts at Capacity and Redundancy Reduction

Mr. Weldon. Do you believe that the services' laboratory restructuring proposals have successfully addressed the problems of excess capacity and capability redundancies within their labs? What plans are there for further reductions in the laboratories after this last round of BRAC actions?

Dr. Kaminski. There are two components to laboratory capacity: facilities and personnel. There does remain excess facility capacity in the RDT&E community primarily due to the large up-front costs associated with closing facilities. However, the Department continues to reduce its personnel capacity and will reduce it from its peak by 35% by 2001.

Impact of Lab Capacity on Outsourcing

Mr. Weldon. If in fact, excess capacity still exists, won't this impair DoD's ability to outsource more of its R&D activities because of ever increasing overhead cost associated with excess lab capacity? To what extent will the cost of excess lab capacity reduce funding for R&D?

Dr. Kaminski. Yes, it will have some impact on our ability to outsource R&D activities. However, the DoD will continue to use full-time equivalent reductions to manage the in-house/out-house ratio.

OSD Lab Management Structure

Mr. Weldon. Can you explain the OSD management structure for the complex of DoD laboratories?

Dr. Kaminski. The DoD laboratories and test ranges are operated and managed by the Services as part of their acquisition structures to assist in fulfilling their

Title 10 responsibility to train and equip the armed forces. Within OSD, the Director, Defense Research and Engineering, has oversight responsibility for 81 DoD laboratory activities. The developmental test and evaluation portion is managed by the Director, Test, Systems Engineering and Evaluation, and includes 21 facilities in the Major Range and Test Facility Base.

Retention of Staff

Mr. Weldon. What is the plan to retain an effective, technically competent staff for the future service laboratory system?

Dr. Kaminski. The DSB Lab Management Task Force cited industrial experience as demonstrating that downsizing is an intrinsic component of modernization. DSB warned that the reductions directed by the Defense Planning Guidance (4% per year for five years) equated to attrition; and given civil service rules, this meant retirement of senior mentors with no input of new talent. No R&D organization can sustain quality for long under such conditions, so DSB recommended an additional 20% surgical cut with funding remaining at the labs to support targeted regrowth, outsourcing, and other modernization initiatives.

Thanks to authority granted by Congress, the Department is currently developing personnel demonstration projects, similar to those at China Lake and San Diego, which will include approximately one-half of the total laboratory population. One of the principal motivations for these is to enable management of skill and expertise levels to ensure adequate capability is maintained within the service laboratory systems. As soon as the results of these projects are analyzed, authority will be sought to extend the effective portions to the rest of the laboratory community.

DOD's Oversight of Its FFRDC's

Mr. Weldon. For the past several years this committee has been concerned with DoD's oversight of its FFRDC's. Does OSD have any plan to evaluate DoD's continuing need for FFRDCs as required by OFPP Policy Letter 84–1 and FAR 35.017? In an attempt to reduce infrastructure costs, is OSD considering downsizing and restructuring its FFRDCs?

Dr. Kaminski. OFPP Policy Letter 84–1 and the FAR require that every five years there is a comprehensive review performed by the sponsor that addresses the continuing need for each FFRDC's services. This review is performed and has been performed in accordance with the guidance in these two documents. However, in response to the concerns of the committee, the Director Defense Research & Engineering has developed a DoD Management Plan for FFRDCs. In this plan additional guidance on what to include in the Comprehensive Review was provided to FFRDC sponsors. The DoD Management Plan requires that the DDR&E concur with the comprehensive review prior to renewal of the contract or termination of the FFRDC. In addition, the plan requires that in years when a comprehensive review is not required, that the sponsor provide an Annual Review Assessment to the DDR&E. This ensures adequate DoD involvement in the process that is used to evaluate the need for FFRDCs and oversight of FFRDC performance.

OSD continues to explore all feasible means to reduce the costs of defense; this includes cost of acquisition, ownership, infrastructure and any other area in which savings might be realized. With respect to FFRDCs, the Defense Science Board was requested to review the Role of FFRDCs in the DoD Mission and provide recommendations to the Secretary of Defense. During this review, the DSB came to the conclusion that the work performed by the FFRDCs was extremely high quality and provided significant value to the Department. It was recommended however that the DoD ensure that the work being performed by the FFRDCs be "core" work. The DoD is working with the FFRDC sponsors to clearly define the "core" work that can only be performed by each FFRDC. Work that is "core" will continue to be performed by the FFRDCs. Any additional work proposed for taskings to the FFRDCs will have to meet the test of whether or not it is "core." The Department's continued need for FFRDCs still exists and the quality of their work is high. The size of resources allocated to the FFRDC will be determined by the need for them to accomplish "core" work that addresses high priority DoD needs. Their size would diminish if this need is reduced.

FFRDC Plan

Mr. Weldon. What is the Department's justification and plan for its FFRDCs over the FYDP?

Dr. KAMINSKI. The Department anticipates a continued need for the FFRDCs over the FYDP. The process used by the Department to review and oversee the FFRDC is reflected in the FFRDC Management Plan (copy attached).

DEPARTMENT OF DEFENSE
FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTER (FFRDC) MANAGEMENT PLAN

INTRODUCTION

DoD-sponsored Federally Funded Research and Development Centers (FFRDCs) represent a long-term Government investment in a unique resource for research, systems development, and analysis. Over the years FFRDCs have been essential contributors to maintaining the superiority of United States forces. FFRDCs perform work that is (1) crucial to the mission and operation of their sponsoring organizations and (2) cannot be performed as effectively by existing in-house, other non-profit, or for-profit contractor resources.

Because of the importance and unique status of FFRDCs, the DoD must ensure that their use is appropriate and that DoD has effective policies and procedures for their management.

PURPOSE

This plan defines DoD policies and procedures for the establishment, management, use, and termination of DoD-sponsored FFRDCs. It also provides guidelines and procedures for ensuring compliance with the Government-wide policies set forth in Office of Federal Procurement Policy (OFPP) Policy Letter 84-1, and Federal Acquisition Regulation, Part 35.017.

BACKGROUND

DoD FFRDCs are currently operated by universities or privately organized, non-profit corporations under long-term Government contract. Their mission is to provide the high-quality technical work and analysis, required by their sponsors. They are outside of the Government to permit the management flexibility necessary to attract and retain quality scientists, engineers, and managers. The common goals for these centers are to: (1) provide a stable long-term relationship and in-depth knowledge of their sponsors programs and operations; (2) maintain continuity and currency in their special fields of expertise; (3) maintain objectivity and a high degree of competency in their staff and work; and, (4) provide the ability to respond to the emerging needs of their sponsors. FFRDCs provide both long-term and immediate, short-term assistance to help sponsors meet urgent and high priority requirements. They are granted

privileged access to Government and contractor information, and as such, bear a special responsibility to avoid conflicts of interest and have accepted stringent restrictions to their scope and method of operation.

The DoD currently sponsors 10 FFRDCs managed by eight parent organizations (see Appendix A). The ten FFRDCs fall under one of the three categories of FFRDCs defined by the National Science Foundation. This management plan recognizes the different purposes and contributions by organizations in each category. The distinctions between categories of FFRDCs are an important consideration in the management approach that should be applied to each of them. The three categories as represented in the DoD are:

(1) Studies and Analyses (S&A) Centers: S&A centers were created and exist to deliver independent and objective analyses and to advise in "core" areas important to their sponsors in support of policy development, decisionmaking, alternative approaches, and new ideas on major defense issues.

(2) Systems Engineering and Integration (SE&I) Centers: SE&I centers were created and exist to provide required support not available from sponsor's in-house technical and engineering capabilities to ensure that complex systems will meet operational requirements. The centers assist with the creation and choice of system concepts and architectures, the specification of technical system and subsystem requirements and interfaces, the development and acquisition of system hardware and software, the testing and verification of performance, the integration of new capabilities and continuous improvement of system operations and logistics. They often play a critical role in assisting their sponsors in technically formulating, initiating, and evaluating programs and activities undertaken by firms in the for-profit sector.

(3) Research & Development (R&D) Laboratories: R&D laboratories were created and exist to fill voids where in-house and private sector research and development centers were/are unable to meet DoD needs. Specific objectives for these FFRDCs are to: (1) maintain over the long-term a competency in technology areas where the Government cannot rely on in-house or private sector capabilities, and/or (2) develop and transfer important new technology to the private sector so the Government can benefit from a wider, broader base of expertise. R&D laboratories

engage in research programs that emphasize the evolution and demonstration of advanced concepts and technology, and the transfer or transition of technology.

RESPONSIBILITIES

The Director of Defense Research and Engineering (DDR&E), consistent with the provisions of this plan, is responsible to the Deputy Secretary of Defense through the Under Secretary of Defense for Acquisition and Technology to:

- Ensure that funding ceilings established for each of the FFRDCs are consistent with overall DoD requirements and strategy.

- Monitor the mechanisms used by FFRDC sponsors to ensure the appropriateness and value of FFRDC efforts and activities.

- Oversee implementation and execution to ensure compliance with this management plan by each FFRDC sponsor.

The head of the sponsoring agency for each FFRDC will be responsible for ensuring that each FFRDC is being used only for the intended purposes, the costs of the goods and services it provides are reasonable, that it produces high-quality work, and that recipient organizations make appropriate use of that work. The sponsoring agency is also responsible for reviewing descriptions of work proposed to be done by the FFRDC and ensuring that the work assigned is consistent with the mission of the FFRDC. FFRDC sponsors will assure the DDR&E that these provisions are being satisfied by making a specific statement in the Annual Review Assessment required in accordance with Appendix C.

MANAGEMENT AND USE

Primary sponsors of FFRDCs shall maintain sponsoring agreements and/or operating instructions that establish policies and procedures for the management and operation of the FFRDC. The specific content of these documents may vary depending on the nature of the relationship between the sponsor and the FFRDC. However, at a minimum the following must be included in either the sponsoring agreement or sponsoring agency's operating policies and procedures:

1) A statement of the purpose for establishing the FFRDC, along with a description of its mission, general scope of effort, and the role the FFRDC has in accomplishing the sponsoring agency's mission. This statement must be specific enough to permit a discrimination between work that is within the scope of effort for which the FFRDC was established and work that should be performed by a non-FFRDC.

2) Provisions for the orderly termination or nonrenewal of the contract, disposal of assets, and settlement of liabilities. The responsibility for capitalization of the FFRDC must be defined in such a manner that ownership of assets may be readily and equitably determined upon termination of the FFRDC's relationship with its sponsor(s).

3) A prohibition against the FFRDC's competing with any non-FFRDC concern in response to a Federal agency request for proposal for other than the operation of an FFRDC. This prohibition is not required to be applied to any parent organization in its non-FFRDC operations. Moreover, responses to requests for information, qualifications, or capabilities are not prohibited unless the sponsor chooses to make such a restriction. Also, this prohibition is not intended to preclude laboratory FFRDCs from participation in dual-use technology transfer when appropriate and authorized in their sponsoring agreement.

4) A determination of whether the FFRDC may accept work from other than the sponsor(s). If nonsponsor work can be accepted, a description of the procedures to be followed will be included, along with any limitations as to the nonsponsors from which work can be accepted (e.g., other Federal agencies, State, local or foreign governments, nonprofit or profit organizations).

5) A description of the procedures used to make an annual assessment to evaluate performance in the areas of technical quality, responsiveness, value, cost and timeliness. Also required is a description of the mechanism used to provide feedback to the FFRDC in order to identify and resolve any perceived or real problems.

6) Other requirements as appropriate (for example):

- When cost-type contracts are used, the sponsor(s) should identify any cost elements that require advance agreement and/or approval. Such items include, but are not limited to, personnel compensation, depreciation, various indirect costs such as Independent Research and Development, or others as deemed appropriate by the sponsor(s).
- Where fees are determined by the sponsor(s) to be appropriate, considerations affecting their negotiations should be identified. In establishing fee objectives, evaluation should be made of the sources of capital reserves (e.g., fees, depreciation, facilities capital cost of money, borrowing, etc.) and the application of funds (e.g., capital acquisitions, non-reimbursable costs ordinary and necessary for the operation of the FFRDC, etc.). Working capital needs should be evaluated to assure that balances are sufficient, but not excessive, for the operation of the FFRDC.

FFRDC FUNDING

The overall funding level for DoD FFRDCs is approved by the DDR&E based upon several factors, e.g., sponsor-submitted requirements, established guidelines for determining workload requirements for each category of FFRDC, and the overall DoD funding strategy and budget limitations.

The DDR&E will establish funding ceilings for each FFRDC annually and will ensure that the combined FFRDC funding is within the total authorized for all FFRDCs. The ceilings will apply to FFRDC funding obligations for a given fiscal year. Obligations are defined as DoD funds actually obligated on the FFRDC contract, including offsetting de-obligations.

Requests to the DDR&E for deviations from or exceptions to established ceilings for any specific FFRDC will be presented by the sponsor with appropriate justification.

The guidelines to be used by FFRDC sponsors in projecting workloads and funding requirements for each of the FFRDC categories are:

- Studies and Analyses Centers (S&A). (1) maintain a critical mass of staff capability in major subject areas important to their sponsors, (2) maintain a relatively stable annual level-of-effort to avoid major changes in funding and staff levels, and (3) focus on the kinds of work that cannot be effectively performed inside the DoD or by profit-making firms. The funding levels for this category of FFRDC should not be based solely on the merits of individual projects/tasks because that may preclude the maintenance of "core" capabilities and the ability to privide short term response capabilities. The "core" represents technical staff-years to respond to the sponsor's most important requirements appropriate to each S&A FFRDC. (Appendix B contains the standard definitions of MTS and work year to be used for computing MTS requirements.)

- Systems Engineering and Integration Centers (SE&I). (1) maintain a long-term, stable core capability when the sponsor has determined that no in-house or competitive private for-profit capability exists to perform the requirement as effectively, and (2) respond to changes in workload and funding consistent with the trend in the most relevant portions of the DoD budget (research and development and/or procurement) supporting the types of programs/systems within the FFRDC mission area.

- Research and Development (R&D) Laboratories. Maintain the technical expertise and related capabilities necessary to address the requirements, priorities and objectives of the FFRDC sponsors, the applicable DoD advisory and oversight committees and the DDR&E.

FFRDC REPORTING REQUIREMENTS

The Office of the DDR&E requires specified and ad hoc reports in order to comply with Congressional reporting requirements and to perform its necessary oversight functions and responsibilities. The schedule and content of reports and other submissions currently required are shown at Appendix C.

FFRDC COMPREHENSIVE REVIEWS

Prior to renewal of the FFRDC contract, the sponsor shall conduct a comprehensive review of the continuing use of and need for the FFRDC. This review must be performed in accordance with the Federal Acquisition Regulation, Part 35.017. The resulting determination to approve continuation or termination of the sponsorship shall be made by the head of the sponsoring agency, with the concurrence of the DDR&E, prior to the anticipated contract renewal date. Also, the sponsor shall advise the DDR&E upon the initiation of a required review and the expected date of its completion. At that time, the DDR&E will have the opportunity to advise the sponsor of any special interest items or requirements to be addressed during the review.

Appendix D contains guidelines for the conduct of comprehensive reviews. Sponsors are expected to implement the guidelines to ensure consistency and thoroughness in the review process within the DoD.

APPENDIX A

DoD FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS

STUDY AND ANALYSIS CENTERS

CENTER FOR NAVAL ANALYSES, Alexandria, VA, SPONSOR: NAVY

CNA's work for the Navy and Marine Corps encompasses tactics development and evaluation, operational testing of new systems, assessment of current capabilities; logistics and readiness; manpower and training; space and electronic warfare; cost and operational effectiveness analysis, assessment of advanced technology, force planning, and strategic implications of political-military developments. Twenty percent of CNA's analysts are assigned to fleet and field commands on two-year tours.

RAND PROJECT AIR FORCE, Santa Monica, CA SPONSOR: USAF

Conducts a continuous and interrelated program of objective analyses on major cross-cutting policy and management issues of enduring concern to the Air Force, including studies on preferred means of developing and employing aerospace power; national security threats and strategies; Air Force missions, capabilities, and organizations; strategic and tactical force operations; and technology, support, and resource management.

INSTITUTE FOR DEFENSE ANALYSES (IDA), Alexandria, VA
SPONSOR: OSD

Performs studies and analyses for the Office of the Secretary of Defense, Joint Staff, Unified Commands and Defense Agencies in the areas of defense systems, science and technology, strategy and forces, resource analysis, advanced computing and information processing, training, simulation, acquisition process, and the industrial base.

RAND NATIONAL DEFENSE RESEARCH INSTITUTE, Santa Monica,CA SPONSOR: OSD

Conducts a wide range of research and analyses in the areas of international security and economic policy; threat assessment; defense strategy and force employment options; applied science and technology; information processing systems; systems acquisition, readiness and support systems; and active-duty and reserve manpower, personnel, and training for the Office of the Secretary of Defense, Joint Staff , Unified Commands, and Defense Agencies.

LOGISTICS MANAGEMENT INSTITUTE, McLean, VA SPONSOR: OSD

Conducts research, studies and analyses for the Office of the Secretary of Defense, Military Departments, Defense Agencies, Joint Staff, and Unified Commands in its mission areas: material management, acquisition, installations, environment, operational logistics, international programs, force management, and information science.

RAND ARROYO CENTER, Santa Monica, CA SPONSOR: ARMY

Conducts a wide range of research, studies and analyses in the areas of strategy, force design and operations; readiness and support infrastructure; applied science and technology; manpower and training; threat assessment, and Army doctrine.

SYSTEMS ENGINEERING/INTEGRATION CENTERS

AEROSPACE CORPORATION, Los Angeles, CA SPONSOR: USAF

Performs general systems engineering and integration for DoD space systems. Provides planning, systems definition and technical specification support; analyzes design and design altrnatives, interoperability, manufacturing and quality control; and assist with test and evaluation, launch support, flight tests, and orbital operations. Appraises the technical performance of contractors.

MITRE C3I DIVISION, Bedford, MA and McLean, VA SPONSOR: OSD

Performs general systems engineering and integration for the DoD Command, Control, Communications, and Intelligence (C3I) community. Provides direct support through program definition; specification of technical requirements; system integration; analyses of design and design alternatives; hardware and software review; and test and evaluation. Appraises contractors' technical performance.

IDA OPERATIONAL TEST AND EVALUATION CENTER, Alexandria, VA
SPONSOR: OSD

Provides test and evaluation support to OSD. Provides analyses of test plans, operational assessment and test results for weapons and other systems, including new and proposed equipment of all types. Addresses a range of considerations to include the proposed equipment

of all types, and the relationship of effectiveness to technical characteristics, required support, and deployability.

RESEARCH AND DEVELOPMENT LABORATORIES

SOFTWARE ENGINEERING INSTITUTE, Pittsburgh, PA SPONSOR: ARPA

SEI is charged with bringing technology to bear on rapid improvement of the quality of operational software in software intensive systems; with accelerating the reduction to practice of modern software engineering technology and promulgating the use of this technology throughout the software community; and with fostering standards of excellence for improving software engineering practice.

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MIT LINCOLN LABORATORY, Lexington, MA SPONSOR: USAF

The laboratory carries out a program of research and development in a number of technologies. Program activities extend from fundamental investigations through design, development, and field test of prototype systems using new technologies.

IDA C3I LABORATORY, Bowie, MD; Princeton, NJ; LaJolla, CA SPONSOR: OSD/NSA

Conducts fundamental research for the NSA in (1) cryptology, including the creation and analysis of complex encipherment algorithms, as well as in speech and signal analyses; and (2) various technologies associated with supercomputing and parallel processing including new architectures, hardware, and software (including prototypes), as well as parallel processing algorithms and applications.

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APPENDIX B

MEMBER OF TECHNICAL STAFF (MTS)

A MTS applies to direct professional and consultant labor, performed by researchers, mathematicians, programmers, analysts, economists, scientists, engineers, and others who perform professional-level technical work primarily in the fields of studies and analyses; system engineering and integration; systems planning; program and policy planning and analysis; and basic and applied research.

Educational requirements for MTS employees and consultants are a bachelor degree from an accredited college or university. In rare instances, nondegree personnel may be included, but only if they possess the equivalent of a bachelor degree in education and experience, and are performing work of the same type and level as that performed by degreed MTS.

For cost and ceiling purposes a MTS work year is defined to be 1,810 hours of full time employee or consultant effort (subcontracting dollars and subcontracting labor excluded). The 1,810 hour figure is derived as follows for full time employees:

Total paid hours in a work year		2,080
Less Holidays	(80)	
Vacations		(120)
Sick Leave		(60)
Other Paid Absences		(10)
Total available hour/year		1,810

If cost per MTS work year must be calculated, FFRDC funding, excluding subcontracting to others by the FFRDC, is divided by the number of MTS work years performed by full or part-time employees and consultants.

APPENDIX C

FFRDC REPORTING REQUIREMENTS

This Appendix identifies reporting requirements for FFRDC sponsors.

ANNUAL REPORTING REQUIREMENTS	DUE DATE	DESCRIPTION
Annual Congressional Report and FFRDC Projected Funding Requirements	15 November	Provide DDR&E with FFRDC funding and related MTS data in support of: - Annual Congressional Report - Budget Estimates DDR&E will request the data submission providing an appropriate format. The report should include actual FFRDC funding and MTS for the past fiscal year; estimates of funding and MTS for the current fiscal year; and projections for the two outyears.
Mid-Year Status Update	30 April	Provide DDR&E with a report for use in monitoring FFRDC obligations in accordance with DDR&E guidance. The report should address the sponsors ability to use and fund all authorized ceiling; if they anticipate having ceiling available; and if they anticipate submission of a request for exceptions.
Annual Review Asssessment	30 days after completion, but not later than 31 March	Provide to the DDR&E a copy of the annual review assessment. The requirements for an annual assessment may be met by the comprehensive review during the year that a comprehensive review is required.

ANNUAL REPORTING REQUIREMENTS	DUE DATE	DESCRIPTION
Changes to Sponsoring Agreement/Operating Instructions	Within 30 days of implementation of changes	Provide the DDR&E with copies of changes to the sponsoring agreements and operating instructions. The changes/operating instructions should be in accordance with the Management Plan, OFPP Policy Letter 84-1, FAR Part 35.017, and Public Law.
Comprehensive Review Notification	One year prior to initiation of the Comprehensive Review	Advise the DDR&E of Comprehensive Review initiation. DDR&E will advise the sponsor of any special review requirements.
Comprehensive Review	NLT 90 days prior to current sponsoring agreement termination date	Provide to the DDR&E the results of a Comprehensive Review of the use and need for each FFRDC in accordance with the Management Plan (see Appendix D) OFPP Policy Letter 84-1, FAR Part 35.017, and Public Law. DDR&E concurrence on the Comprehensive Review is required prior to renewal of the FFRDC contract.

APPENDIX D

COMPREHENSIVE REVIEW GUIDELINES FOR DoD SPONSORED FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS

PURPOSE: The purpose of the comprehensive review is to formally analyze the use and need for the FFRDC in order to assist the head of the sponsoring agency with determining whether to continue sponsorship of the FFRDC.

This appendix provides the guidelines for reporting the results of FFRDC comprehensive reviews in accordance with this management plan, OFPP Policy Letter 84-1, and the FAR.

- Identify the FFRDC, its primary sponsor and contracting activity. Include the date and term of the FFRDC's current sponsoring agreement.

- Provide a detailed examination of the sponsor's special technical needs and mission requirements that are being performed by the FFRDC to determine, if and at what level, they should continue to exist (FAR 32.017-4 (c)(1)).

  Identify requirements for FFRDC support including known specific programs involved, the level of effort required and the types of tasks to be performed.

- Consideration of alternative sources (FAR 35.107-4(c)(2)):

  Specify the special research, systems development, or analytical needs, skills, and/or capabilities involved in accomplishing FFRDC tasks.

  Explain why the capabilities cannot be provided by in-house personnel, private sector contractors, university-affiliated organizations, or another existing FFRDC. Include statements on the alternatives to the FFRDC that were considered and the rational for not selecting each of them.

- Provide a detailed assessment of the efficiency and effectiveness of the FFRDC in meeting a sponsor's/user's needs including the FFRDC's ability to maintain its objectivity, independence, quick response capability, currency in its field(s) of expertise, and familiarity with the needs of its sponsor (FAR 35.017-4(c)(3)).

  Include a summary of FFRDC accomplishments and their effectiveness in meeting user needs since the last comprehensive review. As a minimum, the quality and timeliness

of the work produced, the number and dollar value of projects and programs assessed, and performance based on the user evaluations should be addressed. A summary of the results of the most recent annual reviews should be included. All users should participate in this portion of the comprehensive review. Discuss any criticisms or concerns that the users had with FFRDC performance and the steps taken to resolve those issues.

- Conduct an assessment of the FFRDC management controls to ensure cost-effective operation (FAR 35.017-4(c)(4)).

  Discuss accounting and purchasing systems; overhead costs and management fees; oversight actions taken to verify cost-effective operations; and other management issues as deemed appropriate.

- Provide a determination that the criteria for establishing the FFRDC is satisfied and that the sponsoring agreement is in compliance with FAR 35.017, FAR 35.017-2, and the DoD Management Plan. Include a statement addressing each of the criteria. Provide a certification that the current sponsoring agreement accurately reflects the mission of the FFRDC.

  Discuss agreements between the Government and the FFRDC. These agreements may cover such items as authorization of management fees, provision of Government facilities and equipment, distribution of residual assets of settlement of liabilities in event of dissolution, maintenance of specific cash reserves, and waivers to accounting policies or regulatory requirements.

- The comprehensive review should provide a recommended course of action and be signed by the head of both the sponsoring and contracting agency(ies). DDR&E concurrence with the results of the comprehensive review is required prior to renewal of the contract or termination of the FFRDC.

FFRDCs—Conflict With Private Sector

Mr. Weldon. How does the department avoid conflict with the private sector with work performed by FFRDCs which is not specialized (i.e., requiring specialized knowledge or conditions)?

Dr. Kaminski. The DoD Management Plan implements the guidance that is included in the OFPP Policy Letter 84–1 and the FAR on this issue. The DoD Management Plan requires that primary sponsors of FFRDCs shall maintain sponsoring agreement and/or operating instructions that establish policies and procedures for the management and operation of the FFRDC. These sponsoring agreements will include a statement of the purpose for establishing the FFRDC, along with a description of its mission, general scope of effort, and the role the FFRDC has in accomplishing the sponsoring agency's mission. This statement must be specific enough to permit a discrimination between the work that is within the scope of effort for which the FFRDC was established and work that should be performed by a non-FFRDC. The Department holds the sponsor responsible for ensuring that only that work which conforms to the OFPP and FAR policy is assigned to FFRDCs. Any proposed work that is not in compliance is competed.

FFRDCs—Competing Vice Renegotiating

Mr. Weldon. What is your view on competing FFRDC contracts vice re-negotiating them on a multi-year basis as they are now?

Dr. Kaminski. The current requirements in the FAR and the OFPP Letter 84–1 to perform a comprehensive review of the use and need for each FFRDC prior to renewal of a sponsoring agreement are substantial and adequate to ensure that the continuation of the FFRDC is necessary. This review assesses the technical needs and mission requirements of the sponsor, consideration of alternative sources to meet the sponsor's needs, an assessment of the efficiency and effectiveness of the FFRDC in meeting the sponsor's needs, and an assessment of the adequacy of the FFRDC management in assuring a cost effective operation. This review, as well as the additional management oversight implemented by the DoD Management Plan provides the Department with sufficient confidence that the work being performed is of significant value to the sponsors.

Additionally, the DSB undertook this question during the course of its deliberations. During these deliberations substantial concerns were raised about competing these contracts. Members of the DSB Task Force were skeptical that the high quality service support needed could be achieved through competitive bids. They fear that requiring competition runs the risk of losing the very valuable corporate base/memory that has been built up over several decades. They believe the risk is overwhelming compared to the advantages. These members of the Task Force and DoD sponsors believe that competition could weaken the nature of the valuable, long-term, and special relationship between the sponsor and the supplier. It would be a competitive environment with all of its disadvantages as well as its advantages. From the sponsors perspective, competing the requirement puts at risk the high-quality support provided by these organizations. I support the views of the DSB Task Force on this issue.

FFRDCSs—Salaries and Compensation Packages

Mr. Weldon. What justification does the department have for the apparent excessive executive salaries and compensation packages?

Dr. Kaminski. The Department does not agree that the compensation paid to FFRDC top executives is excessive. Our independent survey, the GAO surveys, the IG reports and DCAA audits generally find that the salary levels for executives and top managers at FFRDCs are not excessive but are competitive for securing that kind of talent. When the total compensation paid to these individuals is compared with the total compensation paid to private sector organizations the comparison shows that FFRDC executives are paid significantly less than the market would indicate based on the size of and responsibilities for oversight of the organization.

FFRDCSs—Oversight Direction

Mr. Weldon. How does the department provide oversight direction and management functions for FFRDCs?

Dr. Kaminski. The DoD Management Plan for FFRDCs provides policies and procedures for the establishment, use, and termination of DoD-sponsored FFRDCs. The DDR&E developed this plan and has overall policy oversight. The Plan is provided to each sponsor for implementation. The sponsor is responsible for managing its

FFRDC in accordance with the management plan, the approved sponsoring agreement, and the special government advisory boards established to provide research direction to the FFRDC. This structure has been put in place to ensure that the work performed by the FFRDCs meet the most significant needs of the sponsor within the scope of the mission of the FFRDC. The structure also provides the sponsor with a mechanism to evaluate the performance of FFRDC support and recommend changes to FFRDC management when appropriate.

FFRDCSs—Plan To Reduce Activity?

Mr. Weldon. Does DoD have a plan to reduce FFRDC activity? How much current work load in DoD is now being performed by FFRDCs that could be performed by the private sector?

Dr. Kaminski. The DoD Management Plan is structured to ensure that the work assigned to FFRDCs can only be performed by them. The level of activity assigned to FFRDCs fluctuates with these needs. MIT-Lincoln Laboratory funding, for example, has dropped considerably in the last several years, as the requirement for their unique capabilities was reduced. That requirement, however, began to increase in FY 1995 and is expected to go higher in the future. The Department continues to believe that the need for FFRDCs still exists and the quality of their work is high. Changes in the size (resources allocated) are driven primarily by the need for their capabilities.

Based on the rigorous review process which is performed prior to work being provided to an FFRDC, the Department would estimate that the amount of work being done by FFRDCs which could be performed by the private sector is zero or very minimal. The FFRDC review process is performed to ensure that the work requires the specific capabilities where the special relationships with the FFRDC and the sponsor are the key to providing objective, independent analysis.

Personnel Reductions

Mr. Weldon. DoD now spends approximately 25 percent of its basic and applied research budget at colleges and universities, up from 13 percent in 1980. Why is DoD investing a larger share of its budget at universities and what have been some of the payoffs from this strategy?

Dr. Kaminski. U.S. military ascendancy, as was evidenced by the significant technological superiority demonstrated by U.S. military forces during Desert Storm, was enabled by scientific breakthroughs funded by our sustained investment in long-term (basic and applied) research.

University and DoD laboratories are the main performers of the DoD science program. It is industry and the DoD labs that are the main performers of the later stage technology program.

The growth in university research has been, in large part, a reaction to the reduction of funding for defense relevant basic and applied research within industry. Spending on basic research by U.S. industry has been going predominately downward since the mid 1980's. The growth in university research funded by DoD has grown to offset the loss of industrial long-term research experienced as industry cuts back.

Today, when potential adversaries equip themselves with the best materials for sale in the international arms market, there is increased need to seek scientific breakthroughs that, like the laser and the transistor from the past, will lead to great advances in military systems.

DoD funding of basic and applied research has resulted in many technological achievements. For example: DoD funded the development of the laser at Columbia University; and the development of computer time sharing and computer graphics at MIT.

Reducing Weapons Cost

Mr. Weldon. We have terminated our long range bomber program and the Seawolf submarine, in each case because of limited budgets and affordability problems with these systems. Our procurement budget continues to decline, and the systems we are buying are being bought at misery rates. This year the administration has requested two DDG–51s, twelve C/D Hornets, eight C–17s, no bombers, and 2 JSTARS. We moved ahead with what was to be a more affordable sub, the New Attack Submarine (NAS), but every few months it seems we learn of new costs increases in that program. Life cycle cost reductions are important, but if we don't make a concerted effort up front to reduce the development and acquisition costs of basic systems, we won't be able to buy enough to make them affordable. NAS

makes the point all too clear: if all we are going to do is give lip service to affordability without making any concerted effort to actual system cost reductions up front, service modernization is going to fall increasingly behind the curve. Unless the defense budget grows by leaps and bounds, we are going to structurally disarm ourselves. What is the Department doing to reduce the cost of major systems on the front end of acquisition?

Dr. KAMINSKI. Your point is well-taken. Actually, the Department has to do both: focus on reducing costs at the very inception of an acquisition program and strive to reduce life-cycle costs as the program matures. Under the leadership of my principal deputy, Noel Longuemare, the Department is initiating a major cost reduction effort. The main objective of this effort is treat cost as an independent variable. For years, the reigning paradigm in defense acquisition has been to treat performance as the independent variable, with cost and schedule dependent on the level of performance being pursued and the perceived urgency of the military requirement. During the cold war, the pace of modernization was driven by the need to offset a quantitatively superior Soviet threat. Today, we operate in a new security environment, where threats are diffuse and not technologically driven, and a new fiscal environment, with decreasing forces and budgets. These dramatic changes will require the Department to turn the cold war paradigm on its head: we need to take cost seriously and treat it as an independent variable in its own right. This will not be easy. Above all, it will require difficult decisions to set performance goals consistent with cost constraints. Of course, we are also pursuing other avenues to life-cycle cost reduction, including expanding the use of commercial practices and commercial products.

TECHNOLOGY FOR SAFETY AND SURVIVABILITY

HOUSE OF REPRESENTATIVES,
COMMITTEE ON NATIONAL SECURITY,
MILITARY RESEARCH AND DEVELOPMENT SUBCOMMITTEE,
Washington, DC, Thursday, August 3, 1995.

The subcommittee met, pursuant to notice, at 2:10 p.m., in room 2212, Rayburn House Office Building, Hon. Curt Weldon (chairman of the subcommittee) presiding.

OPENING STATEMENT OF HON. CURT WELDON, A REPRESENTATIVE FROM PENNSYLVANIA, CHAIRMAN, MILITARY RESEARCH AND DEVELOPMENT SUBCOMMITTEE

Mr. WELDON. This hearing will come to order.

We are honored today to have with us Dr. Anita Jones, Department of Defense, Director of Research and Engineering, to provide testimony on technologies for personnel safety and survivability. Accompanying Dr. Jones, representing each of the services, is Dr. Jim Hicks, Director of Information Systems and Technology of the Army Safety Center; Richard Healing, Director of the Navy Safety and Survivability Office; and Brig. Gen. Richard Paul, Director for Science and Technology, Headquarters, Air Force Materiel Command.

Let me say at the outset that this hearing is the first in what will be a series of hearings by this subcommittee on ways that we can benefit from dual-use activities, and that is, activities that are being performed as an ongoing part of the requirements of our military that may have civilian benefit and, likewise, may benefit from civilian initiatives in these areas.

Let me say that the second hearing that we will do in this area I think is a very significant subcommittee hearing on DOD activities in the area of environmental initiatives.

Subcommittee staff is working on some of those dual-use initiatives that we are currently performing through the military, especially the Navy, that may have environmental impact. It is a hearing that I think will benefit both the military and the civilian sector.

I realize that the issue of personnel safety and survivability is not the sexiest issue, and the past practice of the Congress, and perhaps the administration, has been that we only focus on these issues when there is a disaster. I was in the Congress when the *Stark* was attacked, in fact, traveled over there with then-Chairman Aspin, and working with Charlie Bennett, then-chairman of the Sea Power Subcommittee, we convened a hearing which resulted in putting approximately $60 million into additional survivability materials for the Navy, including thermal imagers and up-

to-date personnel equipment and materials and state-of-the-art fire pumps and other devices, cutting equipment and tools that would benefit our sailors.

Likewise, we have taken similar steps when disasters have occurred within the military or even nationally, but what I want to do, and as long as I am the chairman of this subcommittee will do, is I want to raise the issue of personal safety and survivability on an ongoing basis throughout the year, and that will be the case in this regard.

So this hearing is not just a one-shot-across-the-bow initiative to learn more. It is a commitment on my part to let the service personnel know that we care about their lives, that we have a real concern about whether or not our R&D is state of the art, whether or not we are getting information from the civilian sector that can benefit them, and whether or not there are things that we can be sharing with the civilian sector that have been developed by the military.

In addition, I think, at least I have noticed—and I would stand corrected if this be the case—that perhaps within DOD we have not done perhaps as good a job as we could have been doing in terms of coordinating the work within the services in these areas. I can recall asking then-Secretary of Defense Dick Cheney if he could even give me a dollar estimate as to the total amount of money we are spending on personnel safety and survivability within DOD, and he could not. To my knowledge, that still cannot be done today.

The point is, if you are developing an oxygen breathing apparatus that is important for the Navy and the Air Force needs one and NASA needs one, shouldn't we at least be coordinating those efforts? And shouldn't the technology work that is being done be shared?

If the military develops a thermal imager, as we have done, shouldn't that technology be shared with the fire departments throughout this country?

In visiting the San Francisco Loma Prieta earthquake 2 days after it occurred several years ago and walking the length of the freeway with the fire department chiefs of Oakland and San Francisco and the incident control director for the State of California, I was struck by the use of sniffing dogs to look for people who may still have been trapped in the debris of the collapsed freeways. And I said to him, "Why aren't you using thermal imagers?" And he said, "What is a thermal imager?" I said, "Well, it is technology the Navy developed years ago that is on board our ships to search for people who may still be alive."

The fact is that there are technologies that I am sure are there that have been developed by the military that we should at least be making the public and the civilian sector aware of. And while they are not testifying today at this hearing, in the audience today are representatives of many of the major national associations who work these issues day in and day out. During the questioning session, I will get into some of the specific areas where perhaps we can be sharing technology, both within DOD and outside of DOD.

The area of training between the services and sharing that training with the civilian sector is an area that perhaps we can focus on, as well as acquisition and expediting the acquisition process.

I am extremely familiar personally with the work the Navy has been doing. It was started out by Joe Taussig, following the *Stark* and the admirable job that he did, and following in his footsteps is Dick Healing. I am interested to learn what the other services are doing, and one of the questions that I will be posing to the services is: Do we need to have a single point of contact in the other services as we have with Dick Healing in the Navy? And perhaps that is already there and I am not aware of it.

Once again, my ultimate goal is to see how we can assist through this subcommittee and through the legislative process in better coordinating the resources and dollars we are already expending. This hearing is not to go after anyone. There is no attempt to go on any kind of a witch hunt here. There is no incident we are going to focus on, but, rather, it is an information-gathering session and hopefully a dialog that can continue.

I also will be interested to know what we are doing in the way of replacing halon which has been our major source of suppression in all of our major platforms across the board, and then finally to get into some of the opportunities for the future.

One of the follow-ons to this hearing that I hope to pursue is not just the issue of life safety cooperation, and especially for emergency responders in this country, but to focus on what are we doing in the area of research against terrorism and to deal with terrorism. And how can we share that technology with the civilian sector, especially our big-city mayors and incident commanders?

Finally, one of the issues that is at the forefront of concern of our cities today is what happens when you have an incident where citizens are trapped. We saw that in the World Trade Center, which I visited the day after it occurred with the chief at the time, Carlos Rivera, and the fire commissioner from New York City. In walking that building, I heard from him the need to have new technologies to help get people out of high-rise buildings and to control the situation quickly.

In talking to the chief from Oklahoma City following that incident, I heard the same thing in terms of extracting people who were trapped.

One of the things I hope to follow up this hearing with down the road is perhaps a smaller hearing or a briefing or some type of public session where we bring in the commissioner from New York City, with whom I have had discussions and who is very interested in this issue, and the chief from Oklahoma, and look at what, if any, technologies the military is working on that could be helpful to an urban search-and-rescue situation, not just a building collapse or a bombing but, for instance, a subway crash, as we had in Philadelphia a few years ago, where extrication of victims was of prime importance.

The International Association of Fire Chiefs has written to me about their concern to responding to a similar situation to that which occurred in Japan, and that would be a terrorist attack using sarin gas, telling me that the technology that we have today would not give protection for our emergency responders to go in

with more than 5 minutes' time to get people out of a trap situation. Does the military have technology that perhaps we can share with the civilian sector to deal with those kinds of incidents?

So I think there is a lot of opportunity here. The military has an outstanding reputation for being on the cutting edge of new technologies—not to say they have it all, because they do not. But let us begin to see if we can share that technology and assist the military to perhaps develop a more centralized focus on what is happening in each of the services.

With that, I welcome you all, and I will now turn it over to my good friend and colleague, the ranking vice chairman of this committee, Mr. Spratt.

STATEMENT OF HON. JOHN M. SPRATT, JR., A REPRESENTATIVE FROM SOUTH CAROLINA, RANKING MINORITY MEMBER, MILITARY RESEARCH AND DEVELOPMENT SUBCOMMITTEE

Mr. SPRATT. Thank you very much, Mr. Chairman. I commend you for calling this hearing. These are not glamorous issues, but they are very important issues, and I have less experience than you with some of these, but one in particular which concerns you, because I know you are probably the staunchest supporter of the firefighters and firemen in the Congress of the United States. I happen to represent the firm in my district, Hoechst-Celanese, which makes, I think, the world's best fire-resistant, fire-retardant materials. It does not come cheap. For that reason, they had a very difficult time marketing that material to the services, for example, for flight suits. They were selling some of these on an experimental basis to Brazil, but they could not sell them to the United States Air Force until the Persian Gulf came along. We were able then, through Hoechst-Celanese, to put together material that layered this fire-resistant or -retardant material with an activated carbon interior and make both a fire-resistant/fire-retardant, and a chemical-resistant uniform as well.

These are things we need to be thinking about before emergencies. For example, we had a surge production problem during that period of time, and when these materials are available, I think we need to have some conscious activity, not just thinking about the high-technology hardware that gets all the headlines but the really important things that can protect the troops on the flight deck and things like that.

So this is a very pertinent hearing, and I commend you for scheduling it. I cannot stay here for the full thing, but I look forward to being here for part of it.

Mr. WELDON. I thank my friend and colleague, and I will raise that issue specifically if you are not here then and would mention it.

I know the Navy has a program in place to buy off-the-shelf technologies for demonstration. I would be interested to hear if the other services have that similar focus so that when we have technological advancements like the technology you are talking about, they are able to acquire those immediately.

Let me add also that the focus of this hearing is obviously not just life safety from the standpoint of fire and disaster, but also

ejection seat safety and incidents involving our troops wherever they may be in hostile environments, where they perhaps have an exposure to gases that may be emitted. All of those are the issues, basically the life safety and survivability of our troops and our personnel.

With that I will turn to our colleague from Tennessee. Would you like to make an opening comment?

Mr. TANNER. Thank you very much, Mr. Chairman. I appreciate the Chair calling this hearing today. I look forward to the hearing. I may not be able to stay for all of it as well, but I will be very interested in the record.

My interest at the moment is in an area of telemedicine and has to do with what has come to be known as the Mediguard program within the National Guard Bureau. When we did our after-action study of the Persian Gulf war, just by way of a little background, it seemed to me, after studying the statistics that came from that encounter, that we very likely could have been in a situation, had the casualties been what some had predicted and had Saddam Hussein been able to put more Scud missiles with perhaps chemical or biological agents aboard them into our troops, that we would be in a position where we would be unable to care for the wounded soldiers and sailors that might have been affected.

Now, there may be something more immoral than going to war in the traditional sense, but if there is, it seems to me it would be to put our young men and women in harm's way without the necessary or attendant ability to take care of them if they get hurt. And so it would seem to me that we ought to keep in place the structure in the Reserve and National Guard in terms of medicine so that on short notice we could and would have the ability to bring to the active forces adequate medical personnel and supplies to handle a situation should it arise.

That is why the committee 2 or 3 years ago enacted what was known as the Mediguard Program which hopefully will entice and encourage medical personnel to stay in the Reserves, and in so doing, be able to go out on drill weekends and, rather than sitting around the armory waiting to give guardsmen or others a physical, go out in the communities that are medically underserved as determined by the Governors of the various States and actually conduct some screening, where the Governor says there is a shortage of medical personnel.

All of the medical people that I have talked to in the Guard think it is worthwhile, think it is a good program, think they are accomplishing something, and now look forward, actually, to drill weekends and active duty, whereas before, quite frankly, they did not have a whole lot to do much of the time.

Having said all that, I would be very interested in hearing about the telemedicine program and how you leverage through communications specialists who need to be called in from time to time on whatever, and how, if any way, we could dovetail that into this program known as Mediguard or the Reserve component of Mediguard.

I appreciate the opportunity.

Mr. WELDON. I thank my friend and colleague, and we will make sure that question is either dealt with here at the hearing or on

the record so that we can clarify whatever points of concern you have.

Mr. Meehan from Massachusetts, would you like to make some opening comments?

Mr. MEEHAN. Well, briefly, Mr. Chairman, I want to compliment you for having this hearing. With the budgetary pressures that we face, certainly technology investments for safety and survivability in the armed service is critical.

Like so many other members, I am supposed to be at another meeting at 2:30, but I am delighted that you are having this hearing and look forward to the information from the panelists and witnesses.

Mr. WELDON. I thank you.

With that, we will turn to our distinguished guests and first panelists. And the leader of this testimony, Dr. Jones, we are very happy to have you here. With that, we would be happy to have you speak. If you would like to submit your testimony for the record, then that would be fine as well.

STATEMENT OF ANITA K. JONES, PH.D., DIRECTOR, DEFENSE RESEARCH AND ENGINEERING, DEPARTMENT OF DEFENSE

Ms. JONES. Thank you Mr. Chairman, members of the subcommittee, and subcommittee staff, I am pleased to be here today to discuss personnel safety and survivability. I would like to submit a statement for the record and make a short set of summary remarks.

Mr. WELDON. Without objection.

Ms. JONES. Our personnel, by the very nature of our mission, are placed in environments that are harsh and potentially dangerous. That is clearly true for combat personnel. They face hazardous and unique environments on the ground, on and under the sea, and in the air. It is also true sometimes, in places of our support personnel, both military and civilian, they are at risk: in maintenance depots, in shipyards, air fields, administrative offices even. And our people are our most valuable asset.

Where we share many health, safety, and survivability challenges with the civilian sector, there we rely on civilian technology. But we have some special needs, and I want to focus on those because we do have a technology program and an acquisition program to develop what we need above and beyond what we can cost effectively buy out of the commercial sector.

Personnel safety and survivability pervades many technology areas, and that is the root cause of why it is hard to come up with one number. It spans many areas: platform design, aircraft, tank and ship, weapons system design, occupational safety aboard ship and in the depot, fire suppression and fire fighting, protecting the individual warrior with clothing, camouflage, armor, sensors, and preventing infectious disease. So it spans a wide variety of areas. So there is not a single technology, there is not a single technology area. Much can be brought to bear to contribute.

If you look at the DOD science and technology program from the point of view of personnel safety and survivability, where it makes sense to solve some problem, to meet some challenge with a central

program, we have one lead service or one component that executes that program and delivers its results across the Department.

Where the issue of safety and survivability is integrally tied to a unique service mission, where it would be best solved in the context of a particular platform or weapons system, then the technology is pursued within that specific context.

The reason we do this is because the solutions are frequently unique to the problem. They have to be found while observing structural size, weight, and performance constraints of a particular platform, for example. But even when solutions or weapon or platform are unique, we use an organization called Tri-service Reliance. It is a set of technology panels where across the components, but particularly in the services, the key technologists in a particular area come together. They may be solving a similar safety problem, for example, a fire fighting problem, but in the context of Army ground combat vehicles, vice submarines, vice surface ships. They come together, have dialog, air alternative approaches, and talk about how they are approaching their problems and eliminate unwarranted duplication. So we have mechanisms whereby we can do the coordination, and, of course, in my office we do assessments of the technology program and the technology plans for the future. In fact, we just finished using outside premier, respected scientists and engineers in this country to review the 19 different technology areas to ensure that we do have proper evaluation and oversight.

In my statement, I talk about how we are organized for managing technology in general, how we from the Office of the Secretary exercise oversight, how we do coordination across the services, across the components. And I would like to spend the rest of this short time actually talking about some examples of technology, because I think that can be used to convey a lot of messages.

First I want to focus on firefighting. As I said before, we buy commercial for firefighting needs, as does the civilian sector, where that is the appropriate thing to do. And one of the services is going to talk to you about that in some more detail. But we do have a technology development program. It is in the Navy and the Air Force predominantly, and there are four areas:

Alternatives to toxic or environmentally damaging firefighting agents; for example, replacing the halon agents, as you mentioned, Congressman Weldon. There we are looking at two approaches. One is substitute compounds, some out of the commercial arena, some out of the laboratories being developed from materials research. But, second, to look at alternative techniques for using agents for fighting fires, and there, for example, we are adapting or have adapted in the Navy a commercial method of flooding machinery compartments with water mist where you control the droplet size and that helps the flood be more effective. In fact, it is effective in petroleum fires. The Navy is about to do a full-size machinery space test on the fire ship, the ex-U.S.S. *Shadwell.*

Mr. WELDON. Just for the record, that is coming up in September, I think.

Ms. JONES. Yes.

Mr. WELDON. You have extended an invitation for members to witness that.

Ms. JONES. The second area is methods and agents to combat exotic materials fires. We use exotic materials like composites in some of the weapons platforms. They often burn hot, and they produce dense smoke, toxic materials, and so we are looking for agents to help us fight those kinds of fires, because we must use those materials to contribute to attaining a military advantage over our adversaries.

Third, in that particular area, we are also doing laboratory assessments of the burning characteristics of composite materials, combustibility, heat output, smoke production, and, as I said, toxic combustion byproducts. General Paul will address a little bit about this, and, in fact, how we use Reliance to share results across services in this area.

Fourth, we have some efforts ongoing in firefighter protection equipment. We have a unique challenge in extremely hot fires, in fires where exotic fuels such as propellants of pyrotechnics are fueling the fire, and, as I said earlier, fires where we have exotic materials burning that produce toxic fumes and dense smoke. In fact, some of the materials are self-oxidized. They burn even in the absence of oxygen and so produce a particular problem.

In that context, I would like to show you one firefighting ensemble that we have produced. Again, this is military-unique, and, Dick, if you would lift that placard, we are looking at an ensemble that will deal with very hot fires, particularly where there are hazardous materials present and where there is great concern for providing for breathing.

Captain Smith will hold up, first of all, the undergarment that we use for cooling. It is lightweight Nomex material, and on the inside, when you look at it, you will see it is covered with plastic tube through which glycol or water can be pumped, and that is the basis for cooling.

Second, there is a firefighting suit. This is to defeat the radiant temperature or the radiant heat.

There is a third component which is the chemical and hazardous material. This is an airtight suit for use in entering areas where you have hazardous material, especially involved in fires.

The last component I want to focus on is the backpack that is on the left of the table, and that is the heart and soul of this ensemble. It pumps either glycol or water through the tubes in the cooling wear that goes under the thermal or hazardous suit. It uses a heat exchanger to extract heat from the fluid that is being pumped, and it provides the oxygen for breathing. In the center is a tank that has liquid oxygen. These are not air bottles. This is liquid oxygen. That is under high pressure. We use the pressure—this is a really fine feat of engineering. Notice that this is no longer, is even smaller, than some scuba tank gear and larger certainly than some of the civilian firefighting oxygen backpacks that are worn. The pressure in the tank is used to provide the energy for the pump that pumps the liquid in the cooling.

The heat exchanger that is in there exchanges the heat in the liquid being pumped with the liquid oxygen that, after a while, will cause it to go gaseous because of the addition of caloric content, and that gaseous-phase oxygen is then used for breathing. That is

maintained at a 60- to 80-degree temperature so as not to stress the fireman's lung system.

There are two tanks. One is effective for an hour; a second, slightly heavier tank, 6 pounds heavier, will last—no, 8 pounds heavier, will last for 2 hours. So it is extremely long lasting.

So this is an example of a complementary system to the commercial firefighting systems that is particularly developed for the harsh extreme and chemically hazardous circumstances that we see in the military.

The second thing I want to emphasize—and I think this will be discussed more by Mr. Hicks from the Army Safety Center—is the Army has done a really noteworthy job of creating helicopter fuel systems that protect personnel after a crash, and he will discuss this further. You might pay particular attention to the breakaway valves that ensure that only a small amount of fuel could fuel an aftercrash fire.

Some of my colleagues here will also talk to you more about use of commercial technology products. I want to close to give them an opportunity to follow up. I have just sketched some attribute of our technology program, stressed our coordination, stressed the complementary use of civilian products. There are many challenges ahead because, as you said, this is a crucial area. People are our most important asset. I certainly welcome the opportunity to come and talk to this committee because I think it is important to air to the Congress and to the public, as you said earlier, what the military is doing, because it is considerable. We do work with the other agencies.

Let me highlight one other area where we are working with the civilian community, and that is in the law enforcement area. I have particularly been participating in this because I, like you, think it is important that we move military technology to civilian law enforcement and firefighting application where it is appropriate. With the encouragement of Congress last year, we signed an MOU with the National Institute of Justice and have started a cooperative program. That is in AARPA by and large. It extends our previous cooperation particularly with the FBI and the Drug Enforcement Agency.

We are making available military technology for evaluation by the law enforcement agencies. It is the case that while the technology may be the same, because the rules of engagement are different, because the situations have some differences, the way you package it and the tactics with which you would actually employ, deploy that technology are different in the different application. So an evaluation is appropriate.

I appreciate being able to talk to you here today. I would certainly be happy to answer any questions now or in follow-on, now or after the service representatives who have accompanied me have spoken.

Thank you for this opportunity.

[The prepared statement of Ms. Jones follows:]

Hold Until Released
By The Committee

DEPARTMENT OF DEFENSE

STATEMENT BY

DR. ANITA K. JONES

DIRECTOR DEFENSE RESEARCH AND ENGINEERING

TO THE

SUBCOMMITTEE ON

RESEARCH AND TECHNOLOGY

OF THE

HOUSE COMMITTEE ON NATIONAL SECURITY

AUGUST 3, 1995

Mr. Chairman, members of the subcommittee and the subcommittee staff, I am pleased to be here today to discuss Personnel Safety and Survivability and supporting elements of the Department of Defense's Science and Technology (S&T) program. I will provide an overview of the S&T program and its Personnel Safety and Survivability segments and highlight some examples of ongoing projects. I will describe the Tri-service Project Reliance coordination and management structure for science and technology for it applies to Personnel Safety and Survivability projects.

OVERVIEW

The Department's S&T program is one of the most important tools needed to maintain our military superiority and to enhance our economic security. The program is an integrated, comprehensive program which is directly responsive to the warfighter's needs. The Defense S&T Strategy has been developed to document and communicate the overall vision that guides our investment decisions. This Strategy was developed cooperatively with the Science and Technology Executives for each of the Military Departments and Defense Agencies as well as the Deputy Under Secretary of Defense for Advanced Technology and the Joint Staff.

Flowing from the Strategy is the Defense Technology Plan. In this plan the Department has, for the first time, integrated the S&T efforts

into nineteen discrete technology areas for planning and oversight purposes. The primary purpose of the plan is to document the near term objectives as well as the far term approaches to achieve the goals articulated by the warfighter for each of these technology areas. The plan also identifies funding that has been allocated for these objectives and the timeframes in which these technologies will be available to be transitioned to new warfighting capabilities in the field.

The Defense Technology Plan provides a way to communicate our objectives and ongoing projects to the development community, the warfighters, the Congress and others who can help us to structure an efficient and effective program. The Technology Plan highlights the opportunities for transitioning technology rapidly into fielded systems and the projected operational payoffs, as well as the commercial potential of these efforts. It is updated annually, and is used to ensure that individual service and agency efforts are in consonance with the overall S&T Strategy and vision.

PERSONNEL SAFETY AND SURVIVABILITY

Our personnel, by the very nature of our business, are placed in environments that are harsh and potentially dangerous. Our people are our most valuable asset. It is for these reasons that Personnel Safety and Survivability issues pervade so many technology areas of the

research and development program. The Department of Defense has always recognized Personnel Safety and Survivability of the warfighter as a critical element in achieving and maintaining battlefield superiority. The science and technology program complements what is done in the civil sector with a wide range of efforts, such as:

- platform design (aircraft, tank, and ship),
- occupational health and safety,
- fire suppression and firefighting (techniques and equipment),
- elimination of toxic and environmentally damaging substances,
- weapon system design,
- protection of the individual warrior (protective clothing and body armor),
- prevention of infectious disease, and
- camouflage, concealment and deception.

The Department's S&T program addresses the needs of the warfighter in the field as well as the needs of the maintenance and support infrastructure necessary to ensure the effectiveness of the first line warrior. The unique and often hazardous environments that our warfighters face on the ground, on and under the sea, and in the air result in high priority challenges for Personnel Safety and Survivability. In addition, personnel who are part of the supporting infrastructure often share safety and survivability challenges similar or identical with those

of the civilian community. For example, the DoD, like the civilian community, operates industrial facilities such as maintenance depots and shipyards, as well as administrative offices. In these areas, the Department strives to utilize technologies and equipment developed by the private sector.

OVERSIGHT AND MANAGEMENT

The pervasive nature of safety and survivability issues throughout the technology base and the need to tailor solutions are the main reasons why neither the Department, nor the Services, centrally manage Personnel Safety and Survivability research and development. For example, even though there are Personnel Safety and Survivability issues associated with virtually all platform design efforts, these issues are logically addressed by the platform designers and developers. Platform design solutions are frequently unique to the specific structural, size, weight and performance constraints of the platform. While platform designers strive to utilize the latest technologies available to address Personnel Safety and Survivability issues, specific solutions must be tailored to a platform's design parameters. In contrast, there are centrally managed elements of the Personnel Safety and Survivability science and technology program which apply to a broad range of needs, for example, firefighting, protective clothing, and occupational health and safety. In short, we centrally manage Personnel Safety and Survivability

projects that address problems applicable across wide segments of the Department.

Each of the Military Departments organizes and manages Science and Technology differently. This is a matter of history, organizational philosophy, and Service specific requirements. Similarly, the Science and Technology program is planned and executed by the Services and selected agencies. This diversity actually helps. When one service takes the lead in a technology effort, al using services evaluate the work. When Service unique programs are fielded, they stimulate dialog between the program offices and provide alternate approaches for tackling emergent issues. All of these organizations, with the assistance of my office, work closely together to coordinate their efforts, and to avoid any unnecessary duplication of effort.

Coordination within each technology area is accomplished through the Tri-service Project Reliance process. Each technology area has a panel comprised of senior members from each Service organization. The panels have developed an internal taxonomy which assists with development of the technology area plans and separates technologies into sub-areas which allows assignment of a lead service. A comprehensive technology area review is completed annually for each of the nineteen Science and Technology areas. This year we have strengthened this

review process through the institution of Technology Area Review and Assessment (TARA) Teams. There is a TARA Team for each technology area. Each TARA Team is composed of independent, well established, if not nationally renowned, technical experts in the field. The addition of this external element to the review process not only helps ensure balance and technical excellence in our program, but it also permits increased visibility into the Department's programs which can aid in developing cooperation and collaboration within the technical community at large.

Let me provide several examples of military challenges and technology solutions.

FIREFIGHTING

Firefighting S&T is a sub-area under the Civil Engineering and Environmental Quality technology area. There is a firefighting sub-panel which reports to the Joint Engineers Management Panel which coordinates the entire technology area. Currently, the bulk of the funding for firefighting S&T resides in the Navy and Air Force budgets. These efforts address unique needs of the Department. Firefighting research and development efforts are currently focused in four broad categories.

These areas are:

- alternatives to toxic or environmentally damaging firefighting

agents,

- firefighter protection equipment,
- methods and agents to combat exotic materials fires, and
- assessment of the burning characteristics of composite materials.

Alternative Firefighting Agents

Several of the primary firefighting agents have been shown to be either toxic or environmental damaging. For example, the halon agents used in protecting weapon systems and critical mission support facilities contribute to ozone depletion. The Montreal Protocol banned production of halons starting at the end of 1994. The elimination of this entire family of firefighting agents has serious implications as they are used in a wide variety of military applications. In addition, Aqueous Film Forming Foam, which is a primary firefighting agent used against petroleum based fires, has proven to be both toxic and non-biodegradable. We are developing alternatives for both of these agents. Two broad approaches are being pursued. One is to identify substitute compounds and the other to develop alternative firefighting techniques.

The search for halon firefighting agent substitutes is part of a broader program to develop surrogates for all Ozone Depleting Substances (ODS) in the Department's inventory. Halon 1301 is an

exceptionally effective fire extinguishing and explosion suppressing agent. It is currently used extensively in ships, aircraft, tanks and weapons systems! Suitable substitutes must not only have the same efficacy as a firefighting and explosion suppression agent, they must also be non-toxic and environmentally safe. Additionally, use of the substitute must not carry a significant penalty in terms of weight or volume of the material required. Several substitutes are under development. In addition we are examining and testing commercial candidate substitutes.

As an alternative technique, the Naval Research Laboratory has had significant success in adapting a commercial method to combat fires in machinery spaces on our ships. This technique involves flooding the machinery compartment with a very fine water mist. The technique was commercially developed in Sweden for structural fires. By carefully controlling the size of the droplets, researchers successfully used this method to extinguish major test petroleum conflagrations and will shortly test the technology in the full-size machinery space mock-up onboard the fire test ship, the ex-USS Shadwell.

Firefighter Protection

The protection of firefighters as well as the provision of breathing air has long been a problem for the military. This problem is exacerbated

by the presence of exotic fuels such as propellants and pyrotechnics which produce extremely hot fires as well as toxic fumes and dense smoke. Protective ensembles must not only provide breathing air and protection from the heat, but most also provide protection from toxic gases, liquids and particulates. To meet this need, the Natick Research Center is developing a cryogenically cooled firefighting ensemble that will significantly improve the firefighter's ability to work in intense heat and for longer periods of time. This joint Army/Navy/Air Force/NASA effort will provide the firefighter up to two hours of breathing capacity. In addition, the suit may extend the temperatures that the firefighter can withstand to 3000°F. The suit is designed to be both fume and water tight and will provide protection for a firefighter working in a hazardous environment.

Firefighting in the Presence of Exotic Materials and Fuels

Among the unique Department of Defense firefighting needs is the need to be able to suppress, detect and combat fires involving exotic materials and fuels. Exotic materials and fuels have the capability to burn intensely in the absence of oxygen. A polymer foaming agent to blanket this type of intense fire is under development. In addition, some of these materials burn with a colorless, smokeless flame and are also difficult to detect. One solution to detection is a sophisticated, laser-based system which is currently undergoing testing.

Composite Materials Firefighting

The increased use of high performance materials such as composites introduces new challenges to the firefighter. Composites may burn rapidly radiating intense heat and produce highly toxic fumes and intense smoke. Conventional firefighting agents may not be effective in extinguishing these materials. There is an existing project to test composite materials to determine their burning characteristics: combustibility, heat output, smoke production and the formation of toxic combustion byproducts. The results of these efforts will be used to develop strategies for combating fires in which composites and other high performance materials are involved. Brigadier General Paul, Director of Science and Technology for the U. S. Air Force Material Command will discuss, in detail, DoD firefighting and how Project Reliance addresses all the Service needs in this area.

CRASHWORTHY FUEL SYSTEMS

The bulk of the fatalities in an aircraft crash, military or civilian, have not been caused by the impact, but result from the ensuing fire fed by fuel remaining in the aircraft. The Services have suffered personnel losses and injuries resulting from post-crash fires, particularly in helicopters. Recognizing this as a serious problem, the Army instituted a research program to develop helicopter design modifications to make

such crashes more survivable. One result was a crashworthy fuel system for helicopters. This system is comprised of impact resistant fuel containers and breakaway fittings to minimize fuel spillage and dispersion. These two modifications to the fuel systems dramatically reduced the number of fire related fatalities and injuries associated with helicopter crashes. It was important that these modifications fit within the limiting constraints of the structural, weight, size and performance of the aircraft, and are readily retrofitted into existing helicopters. Dr. Hicks, Director of Information Systems and Technology at the U. S. Army Safety Center will discuss in detail the Departments efforts in this area.

NON-DEVELOPMENTAL ITEMS

Non-Developmental Items (NDI) and their exploitation by the Department grew from a concept to accelerate fielding of advanced technologies. The Department's use of safety and survivability Non-Developmental Items during the past ten years has significantly reduced loss of life and physical assets while eliminating the costs associated with research and development. One of the early and most successful examples of the use of safety and survivability Non-Developmental Items is the Department's acquisition of the Naval Fire Fighters Thermal Imager (NFTI). This device, which was developed by the Royal Navy and extensively tested by the Naval Research Laboratory enables firefighters to locate a fire in a smoke filled compartment. Similarly, procurement of

shipboard damage control and firefighting Non-Developmental Items during Operation Desert Storm enhanced sailor safety and survivability during combat operations. Mr. Healing, the Director of Safety and Survivability within the Office of the Assistant Secretary of the Navy for Installations and Environment will discuss acquisition and use of private sector items in more detail.

Mr. Chairman, I have briefly summarized the Department's S&T management and oversight process and have highlighted some of the ongoing efforts and some results in the area of Personnel Safety and Survivability. We are making significant progress in providing our warfighters with the equipment necessary to limit personnel casualties. There are other areas in which we are developing new technology, new methods and new systems. And I have not addressed the important area of combat casualty care. There too, we are making advances.

Where applicable and to the extent possible, we are sharing these advances with other government agencies, such as the Department of Energy, NASA, the Federal Aviation Administration and the private sector. We are also making concerted efforts to utilize techniques and technologies developed outside of the Department.

I appreciate the opportunity to appear before the subcommittee and discuss this area that is critical to the protection of our people. I will be happy to answer any questions you may have.

Mr. WELDON. Thank you.
General Paul, welcome.

STATEMENT OF BRIG. GEN. RICHARD "DICK" PAUL, DIRECTOR OF SCIENCE AND TECHNOLOGY, AIR FORCE MATERIEL COMMAND

General PAUL. Thank you. I also will submit a statement for the record but would like to make just a few summary comments.

Mr. WELDON. That is fine. Without objection.

General PAUL. We welcome the opportunity as well to discuss our personnel safety and survivability issues. The focus of my remarks will be on firefighting and the Air Force science and technology program with respect to firefighting. We have over 9,000 Air Force military and civilian firefighters worldwide to protect our bases and our personnel, and so we take very seriously our responsibility to provide them the best training and the best equipment possible.

I would like to start by reemphasizing the point that Dr. Jones made that we do have a formal structure within the services for collaboration and cooperation, and that is called Project Reliance. We have established panels, technology panels for a number of different disciplines. Those panels are occupied by all members of the service and have a rotating chair, and we do joint program planning in those panels to assure that we are not duplicating one another, that we are getting access to the best ideas from all the services, and that we operate efficiently.

Under Project Reliance, the Air Force is the lead service for firefighting science and technology, and with that responsibility we prepare each year a Defense technology area plan. That is a coordinated service plan that outlines our vision, our goals, and our projects for science and technology in this particular area. We also have mechanisms by which we work with other executive agencies such as NASA and the Federal Aviation Administration, and I will give you a couple of examples of those later.

Our overriding philosophy in meeting science and technology or Air Force firefighting needs is to go first and foremost to the commercial sector. So in that regard, we have a very active program to test commercial equipment. In fact, 90 percent of all Air Force firefighting procurements are commercial products.

Over the past 5 years alone, we have tests and evaluated over 81 commercial off-the-shelf products and as a result have directly procured 11 of those products. One example of a product that we have procured off the shelf from the commercial sector is the 1-hour self-contained breathing apparatus, which is a breathing assistance device that double the capacity over previous devices and really allows our firefighters to have more margin to egress or escape, recognizing that they work very hard and breathe that oxygen very rapidly. We have purchased 10,000 of those units, and over 9,000 of those have been delivered. And I have other examples in my statement for the record.

We do have unique needs in the military, and that is what we focus our science and technology dollars on. In terms of the content of our program, we have a number of unique challenges, some of which Dr. Jones briefly alluded to. One of the first—and you mentioned this in your opening remarks—is we must comply with the

regulations and laws aimed at protecting our environment. So we have a very strong focus on developing environmentally friendly fire extinguishants. So that means acceptable replacements for our current extinguishants will not be ozone-depleting compounds such as the halons that are currently used and will be fully biodegradable, in contrast to our aqueous film-forming foams.

Another challenge is understanding the combustion chemistry of exotic materials and composites. The Air Force and the other services are using on a wider and wider basis composites in our advanced weapons systems. Those materials can very rapidly degrade. They can generate very highly toxic combustion products. So we have a program to understand the nature of that combustion and then look for suppressants to take care of them, again, in an environmentally compatible manner.

A third challenge we have is protecting our personnel from unique environments, and Dr. Jones just gave you a good example of a program that was jointly funded by the Air Force and NASA in this case and is used by all the services, and that is the ensemble that she just explained.

Finally, we are always challenged by the need to provide the best possible training to all of our people, and in that regard, we are looking at the use of virtual reality and other modern simulation tools to provide, again, the best possible training for fire, crash, and rescue.

Our annual S&T investment for the Air Force in these areas is about $1.5 million a year, but it is a very highly leveraged investment because of our collaborative teaming with the other services, with the other agencies, such as NASA and the FAA, and by using commercial products, again, whenever we can.

I would like to share four brief examples to give you another idea of past or present projects so you can get a better idea of the nature of our research, and all of these have very strong dual-use applicability. One is called the aircraft handheld skin penetrator. That was developed to provide firefighters the ability to apply agents around engine nacelles or hard-to-reach places on an aircraft. This particular unit can penetrate an engine nacelle or a fuselage in 15 seconds and then permits the application of gaseous or dry chemical agents. To date, we have fielded over 3,000 of these units throughout the entire Department of Defense, and the Federal Aviation Administration has also adopted this for commercial firefighting.

The second example is something called the aircraft lightweight rescue tool. That was developed to provide rapid entry into cargo aircraft where the door may be jammed or into fighter aircraft where the canopy may be nonoperative. This tool weighs only 25 pounds as opposed to its predecessor, which weighed 75 pounds. Thus, it can be safely operated by one rescue firefighter operating from a ladder. Again, this has been fully fielded throughout DOD and also commercial airports as well.

The third initiative is a joint Air Force and FAA research effort, and that is to determine improvements in fighting large-frame aircraft fires. This particular project will lead to the formulation of strategy and tactics in fighting these fires, what the best combination of agents are, what the right combination of tools and equip-

ment are, and what the unique survivability concerns are for these large aircraft.

Finally, an example of a future project gets back to training. That is called the advanced firefighter training system. Again, we intend to use virtual reality and bring the best the commercial market has to offer in training our firefighters for the unique circumstances that they will experience. This will be developed and complete, we believe, in 1998 and then will be followed by a 2-year program for engineering and manufacturing development and production.

The payoff for this is very obvious when you consider a live exercise costs about $1,000 for 1½ minutes of time. By using these advances simulation techniques, we will be able to much more economically train our firefighters under a variety of circumstances.

So, to conclude my remarks, I would like to emphasize that we are working as a team. We are attempting to make every effort not to duplicate. We share our technology and rely upon the other agencies such as NASA and the FAA, and again, first and foremost, look to our commercial products as the best means to satisfy our needs wherever possible.

Thank you for the opportunity to remark, and I would be glad to answer questions.

[The prepared statement of General Paul follows:]

DEPARTMENT OF THE AIR FORCE

PRESENTATION TO THE
SUBCOMMITTEE ON RESEARCH AND DEVELOPMENT

HOUSE NATIONAL SECURITY COMMITTEE

on

AUGUST 3, 1995

SUBJECT: Personnel Safety and Survivability

STATEMENT OF: BRIGADIER GENERAL RICHARD "DICK" PAUL
Director of Science and Technology
Air Force Materiel Command

NOT FOR PUBLICATION UNTIL RELEASED
BY THE COMMITTEE

BIOGRAPHY

UNITED STATES AIR FORCE

Secretary of the Air Force
Office of Public Affairs
Washington, D.C. 20330-1690

BRIGADIER GENERAL RICHARD R. PAUL

Brigadier General Richard R. Paul is director of science and technology, Headquarters Air Force Materiel Command, Wright-Patterson Air Force Base, Ohio. He directs the Air Force's annual $1.5 billion science and technology program, which is executed by more than 7,000 people in the four USAF laboratories and the Air Force Office of Scientific Research. The general is responsible for planning basic research to ensure continued technological superiority, developing and transitioning new technologies into Air Force weapon systems and their supporting infrastructure, and ensuring responsive technical support to time-urgent problems whenever and wherever they occur.

The general entered the Air Force in 1967 as a distinguished graduate of Officer Training School, Lackland Air Force Base, Texas. He has served in two Air Force laboratories, a product center, two major command headquarters, Headquarters U.S. Air Force, Washington, D.C., and a joint staff assignment.

Prior to his current assignment, he served as commander of Wright Laboratory, Wright-Patterson Air Force Base, Ohio, the largest aerospace laboratory complex in the Air Force.

General Paul is from Gallatin, Mo. He and his wife, Joyce, have a son, David.

EDUCATION:

1966	Bachelor of science degree in electrical engineering, University of Missouri at Rolla
1971	Master of science degree in electrical engineering, Air Force Institute of Technology, Wright-Patterson Air Force Base, Ohio
1975	Distinguished graduate, Squadron Officer School, Maxwell Air Force Base, Ala.
1980	Distinguished graduate, Air Command and Staff College, Maxwell Air Force Base, Ala.
1984	Distinguished graduate, Naval War College, Newport, R.I.

ASSIGNMENTS:

1. May 1967 - September 1969, nuclear safety engineer, Air Force Weapons Laboratory, Kirtland Air Force Base, N.M.
2. September 1969 - June 1971, student, Air Force Institute of Technology, Wright-Patterson Air Force Base, Ohio
3. June 1971 - June 1972, missile trajectory engineer, 544th Aerospace Reconnaissance Technical Wing, Offutt Air Force Base, Neb.
4. June 1972 - February 1976, command and control project officer, Headquarters Strategic Air Command, Offutt Air Force Base, Neb.

5. February 1976 - August 1979, command and control manager, Headquarters U.S. Air Force, Washington, D.C.
6. August 1979 - June 1980, student, Air Command and Staff College, Maxwell Air Force Base, Ala.
7. June 1980 - August 1983, staff scientist, Joint Strategic Target Planning Staff, Offutt Air Force Base, Neb.
8. August 1983 - June 1984, student, Naval War College, Newport, R.I.
9. June 1984 - July 1988, deputy commander for advanced technology, Electronic Systems Division, Hanscom Air Force Base, Mass.
10. July 1988 - July 1992, commander, Wright Laboratory, Wright-Patterson Air Force Base, Ohio
11. July 1992 - present, director of science and technology, Headquarters Air Force Materiel Command, Wright-Patterson Air Force Base, Ohio

MAJOR AWARDS AND DECORATIONS:

Legion of Merit with oak leaf cluster
Defense Meritorious Service Medal
Meritorious Service Medal with oak leaf cluster
Air Force Commendation Medal

EFFECTIVE DATES OF PROMOTION:

Second Lieutenant	May 27, 1967
First Lieutenant	Nov 27, 1968
Captain	May 27, 1970
Major	Nov 3, 1977
Lieutenant Colonel	Dec 1, 1982
Colonel	Dec 1, 1985
Brigadier General	Aug 1, 1992

(Current as of December 1993)

TESTIMONY ON

PERSONNEL SAFETY AND SURVIVABILITY

Mr. Chairman, Members of the Subcommittee and Staff, the Air Force welcomes the opportunity to discuss our Personnel Safety and Survivability issues with the focus of our portion of this hearing on Air Force fire fighting Science and Technology (S&T) efforts. We have over 9000 Air Force military and civilian fire fighters world-wide protecting Air Force bases, personnel, property, resources, and families 24 hours per day. We are very serious about shouldering our responsibility to provide the very best possible training and equipment to protect our personnel, facilities, and systems.

To avoid duplication of S&T investments, under Project Reliance, the Air Force is the lead Service for fire fighting S&T, and coordinates with the other Services on fire fighting needs and prepares a coordinated Defense Technology Area Plan annually to document the Services' plans in this area.

In addition to the Services' S&T programs, the Services conduct a substantial amount of rigorous testing of commercial fire fighting applications. Over the past five years, the Air Force alone has evaluated over 81 commercial products resulting in the direct procurement of 11 products off-the-shelf. Several examples of direct procurements include the One Hour Self-Contained Breathing Apparatus, the Fire fighter Multimedia Training System, the Deployable Fire Protection System, and the High Reach Agent Delivery System.

Fire fighting methods are being revolutionized by regulations and laws aimed at protecting our environment, and by combustion chemistry of advanced composite

materials. Our current, front-line fire-extinquishing agents do not comply with new environmental protection laws. Therefore, our development focus is on environmentally friendly extinquishants and fire fighter training methods. Acceptable replacements for fire extinquishants will not be ozone depleting compounds, as are the Halons, and will be fully biodegradable--in contrast to our aqueous film-forming foams. We are exploring applications of virtual reality technology in development of training systems which will simulate fire, crash, and rescue. The widespread use of composite materials in Air Force weapon systems, generates additional development needs because some composite materials degrade very rapidly and can generate highly toxic combustion products when ignited. Therefore, we need to develop faster, more reliable fire detection and suppression methods, and hazardous materials protection, containment, and decontamination technologies for systems and fire fighting personnel. Evolving technologies provide the opportunity to develop more capable heat and chemical resistant garments, coupled with space age body-cooling technology.

The Air Force fire fighting S&T efforts focus on five major areas: Environmentally Safe Fire fighting Agents; Advanced Suppressant Technologies; Fire fighter Protection Upgrades; Enhanced Fire Detection/Suppression Technology; and Advanced Training Systems. Our annual level of S&T investment in these areas is approximately $1.5M. In order to give you a better perspective of specific products and technologies which we have developed and transitioned, are currently developing, and will be developed to help our fire fighters, it is helpful to examine several examples of past, current, and future projects.

The aircraft handheld skin penetrator was developed to provide fire fighters the ability to apply fire fighting agents in areas around aircraft engines, dry bays, and aircraft interiors which can not be rapidly accessed. The unit can penetrate an engine nacelle or aircraft fuselage in 15 seconds, permitting the application of gaseous or dry chemical agents to inert the area. To date, in excess of 3000 units have been fielded throughout the Department of Defense (DOD) and adopted by the Federal Aviation Adminsitration (FAA) for commercial fire fighting.

The Aircraft Lightweight Rescue Tool was developed to provide crash rescue/fire fighters rapid entry into cargo aircraft with jammed doors or fighter aircraft with non-functioning canopies. The rescue tool weighs only 25 pounds and can be safely operated by one rescue fire fighter from a ladder position. The unit has been fully fielded throughout DOD and commercial airports.

The Halon 1211 recycling and recovery unit was developed to provide the DOD with a capability to recover and recycle Halon 1211 used in fire fighting vehicles, as well as flightline, and aircraft portable fire extinquishers in order to reduce re-servicing costs.

The Central Tire Inflation Deflation System was developed to provide enhanced on-and off-road stability for crash rescue vehicles. The system provides an in-cab capability to instantaneously inflate or deflate the vehicle's tires to obtain the optimum air pressure for the terrain being traversed. This capability permits crash rescue vehicles to safely reach a crash/incident site resulting in reduction of potential fatalities/injuries and fire damage. To date, 147 crash rescue vehicles with this capability have been delivered to military base fire departments. This technology has also been adapted to civilian applications.

Some examples of current programs include the combined Fire Fighting/Hazardous Materials (Hazmat) Ensemble, Halon 1211 Replacement, and Large Frame Aircraft Fire Fighting.

The Combined Fire Fighting/HAZMAT Ensemble is being developed to provide fire fighters with increased heat and hazardous materials protection, and a more capable and efficient air breathing and body cooling system. The need for increased fire fighter protection from hazardous materials was found as a result of our toxicological assessment of composite materials combustion products, in our role as DOD lead agent for toxicology S&T under Project Reliance agreements. The maximum permissable exposure criteria developed at the Air Force-hosted Tri-Service Toxicology Center are being used to formulate protection specifications for this next protection ensemble. Current HAZMAT ensembles are for chemical spills only. Development will be completed in early 1996.

A Halon 1211 replacement is being developed for DOD 150-pound flightline and aircraft portable fire extinguishers, and for total area flood of structures such as hangars, command posts, etc. Current industry proposed replacement candidates have Evironmental Protection Agency (EPA) restrictions on their use, so we continue to work on environmentally friendly alternatives. Our toxicologists at the Tri-Service Center have been very actively working with our materials development scientists and engineers in trying to find Halon substitutes which are active extinquishants, environmentally friendly, and toxicologically benign. Prospects are high for developing a suitable and more effective replacement within the next two years.

A Joint Air Force and FAA research effort is underway to determine necessary improvements required to reduce large frame aircraft losses from fire. This project will lead to the formulation of tactical and strategic decisions which will improve Air Force fire fighting fleet configurations and validate agent quantities, staffing levels, and survivability.

A sample of future projects consist of Blended Agent Fire Fighting and an Advanced Fire Fighter Training System.

Blended Agent Fire Fighting will be developed to provide the capability to combat flowing and pooled aircraft fuel fires or combinations thereof. The Air Force, in a cooperative effort with commercial enterprise, will develop systems capable of encapsulating gaseous or dry chemical agents within turret and/or handline streams.

An Advanced Fire Fighter Training System will be developed using virtual reality technology to realistically simulate crash rescue and fire fighting scenarios. Significant commercial application is anticipated in a wide variety of civil, commercial, federal emergency services agencies, and educational institutions. Development will be completed in 1998 and will be followed by a two year Engineering and Manufacturing Development/Production phase.

CONCLUSION

The Services are working as a team to provide the best fire fighting protection to our fire fighters. We aggressively evaluate commercial applications for potential direct off-the-shelf acquisitions. Focus on environmental issues has driven the Services to develop and evaluate new replacement materials that are environmentally safe and non-

toxic to our personnel. We believe we are working the right S&T projects and priorities to meet current and future fire fighter threats.

Mr. WELDON. Thank you, General Paul.
Dr. Hicks.

STATEMENT OF JIM HICKS, PH.D., DIRECTOR, INFORMATION SYSTEMS AND TECHNOLOGY, U.S. ARMY SAFETY CENTER

Mr. HICKS. Mr. Chairman, also in the interests of time, I would like to enter my full testimony for the record.

Mr. WELDON. Without objection.

Mr. HICKS. For discussion today, I will highlight several items of interest regarding helicopter crash impacts, not only in respect to the technology that is involved there, but how the technology and the process of development of that technology is interwoven into our acquisition of all helicopters.

The Army has organized and maintained longstanding science and technology programs in the area of personnel safety and survivability, and part of that has been the careful review and analysis of accident reports and accident investigations to target those science and technology programs on the worst problems. As a matter of fact, regarding helicopter crash impact, those analyses showed us early on that the most critical hazard in helicopter crashes was post-crash fire. As a matter of fact, in past years, post-crash fire caused up to 40 percent of all the soldier deaths in helicopter accidents.

As a result of that, we then focused research programs which generated the items that are being shown to you. We agree that those are not sexy, but to the 200-odd soldiers that are alive today as a direct result of that, they are quite remarkable.

Mr. WELDON. What are they? Tell us what they are.

Mr. HICKS. Those items, what the staff member has there, is a cutting-out of a fuel tank, a helicopter fuel tank. It is multilayered, it is flexible. The fuel tank itself could be as large as this table, depending on the helicopter. It is flexible in order to allow crews and maintenance people to put the fuel tank in and out. It has multilayers of nylon fabric which provide the crashworthy strength, and it also has two layers of natural rubber, very, very thin natural rubber, that also provides the advantage of, should that fuel tank take a small-arms round, such as up to a .50 caliber in the case of that particular 14.2 millimeter, even an incendiary round, that fuel will activate the natural rubber lining which seals and no leakage. Also, interior to the tank we have a variety of foams and also inerting agents such as nitrogen gas in particularly some of our attack helicopters to further reduce the combat survivability problem.

The other item that is there, the red metal piece, is a break away valve Dr. Jones mentioned. This is an item that goes in the fuel line, and we locate in those particular places where we have predicted substantial displacement of the structure during crash impact. Typically, when those bulkheads and other pieces displace, fuel lines are severed. Even though the fuel tank remains intact, fuel can spray out through those severed lines so that the breakaway fuel valve is designed to break at a particular place. Also, if you look closely, in the interior of the line there is a pop-it that is held, spring-loaded, held apart with a pin, and when it severs, the pop-it closes and there is no fuel leakage.

We developed this technology and then applied it by retrofitting it back into most of the helicopters that we have today. As a matter of fact, as of today, 99.5 percent of all of our helicopters have that technology.

The result of that application of technology was dramatic reductions in the risk and the hazard associated with post-crash fire. As a matter of fact, the numbers changed from, as I said before, 40 percent of all the deaths due to thermal fatalities down to no less than 6 percent. As a matter of fact, that is overstating the case a bit.

We further institutionalized the process of putting that technology into aircraft by developing standardized design criteria, and guides that we have published and have distributed throughout the aviation community, industry as well as the Government, for all future helicopter designs. Furthermore, we established responsibilities and procedures within the acquisition process itself for safety risk management. We call safety as applied to the acquisition process "system safety," and these system safety processes ensure that hazards are systematically identified and then objectively assessed through the acquisition executive or other appropriate decision authority.

We then turned to other hazards associated with crash impact, and then through research that was done in cooperation with the other services and the National Aviation and Space Administration, we developed further technology for improving the crash survivability of soldiers, and, in particular, developed crash-ready fuselage structure, also to develop technology for energy-absorbing landing gears, energy-absorbing seats, and these have been also entered in our new designs. In fact, that technology directly supported the successful fielding of the UH–60 Black Hawk, which immediately has set new standards for safety and survivability, combining flight safety features such as dual-engine capability and this crash-ready fuselage structure to the already successful crash-ready fuel system.

We have exported this technology and the ideas that go with this technology throughout the military services as well as the entire aviation industry. As a matter of fact, the primary source that I use for getting the information and pulling facts together for this particular hearing was a textbook called "Aircraft Crashworthiness," and it was a symposium sponsored by the University of Cincinnati some years ago, cosponsored by the Federal Aviation Administration and National Transportation Safety Board and NASA, where Army technology that I have described here was laid out in detail for everyone's use.

Current system developments are using exactly the same processes and many of the same technologies, particularly on such items as the RAH–66 Comanche. In addition, recent science and technology objectives within the Army are focusing on developing even more efficient ways of defining the hazards and potential design solutions. We have just established a new research program to use mathematical modeling and engineering simulations to define crash impact hazards while the aircraft is still in the early conceptual phases of its design. In this way, we are attempting to leverage information-age technology to efficiently build upon these

earlier ground-breaking work and continue the track record of continuous improvement in the safety and survivability for soldiers.

I will also entertain any questions here, sir.

[The prepared statement of Mr. Hicks follows:]

Hold Until Released
By The Committee

DEPARTMENT OF THE ARMY

STATEMENT BY

DR. JIM HICKS

DIRECTOR INFORMATION SYSTEMS AND
TECHNOLOGY
(U.S. ARMY SAFETY CENTER)

TO THE

SUBCOMMITTEE ON

RESEARCH AND TECHNOLOGY

OF THE

HOUSE COMMITTEE ON NATIONAL SECURITY

AUGUST 3, 1995

Mr. Chairman, members of the subcommittee, and the subcommittee staff, I am pleased to be here today to discuss the program to incorporate crashworthy fuel systems into Army helicopters and related crashworthiness initiatives. I will provide an overview of the origins and objectives of the crashworthiness technology program, the impact of that technology upon Army operations, and the processes used to manage the integration of crashworthiness technology into Army aircraft designs.

Overview

Reducing the risks associated with postcrash fire has been a primary avenue to enhance personnel safety and survivability of soldiers in Army helicopters. Begun in the late 1960's, this effort involved the development and installation of crashworthy fuel systems (CWFS) in all primary Army helicopters and acquisition of fire-protective clothing and equipment for helicopter crews.

The CWFS initiative was part of a long-range aircraft crashworthiness research and development program, which began with the study of data from hundreds of accidents and full-scale crash testing. From this, an understanding was acquired of crash-impact conditions and consequent hazards. Design concepts, techniques, and criteria to eliminate or

manage the risks associated with these hazards were developed and substantiated through testing.

Postcrash-Fire Hazard

From studies of Army helicopter accident reports from the 1960's, it was apparent that even though postcrash fires occurred in a relatively small portion of all cases (approximately 7%), these few accidents accounted for a disproportionate number of all fatalities (in fact, 63% of all fatalities in all helicopter accidents occurred in those few accidents with postcrash fire). The chances for survival for soldiers in helicopter accidents with postcrash fires was 22 times less than for those in accidents not involving postcrash fire.

Based upon detailed review of the accident data, the leading cause of death among rated crewmembers was head injuries--33 percent of the pilot group died of head injuries. Burns and their complications accounted for 29 percent of the deaths and were the second most frequent cause among rated crewmembers. Various other causes were identified for the remainder, but none were as significant as fire and head injury.

However, among non-rated crewmembers, i.e., crew chiefs and gunners, the leading cause of death was not head injuries but burns and their complications (40%).

In March 1968, General Harold K. Johnson, then Chief of Staff of the Army, directed that $3 million in emergency research and development funds be applied immediately to develop a crashworthy fuel system for Army helicopters. His action was generated by the concern expressed to him by various Army field commanders during a trip to the Republic of Vietnam in the spring of 1968. Of particular significance were the reports he received of aircrew and passenger personnel being either killed or seriously injured from burns in what would otherwise have been survivable helicopter mishaps.

Crashworthy Fuel System Technology

In response to the Chief of Staff's directive, the helicopter industry proposed the development of a crashworthy fuel system for the UH-1, then the primary troop carrier. This system had three basic characteristics to nullify postcrash ignition of the UH-1 fuel load. These characteristics were:

o Minimize fuel spillage through the use of impact-resistant fuel containers.

o Minimize dispersion of fuel through the use of breakaway fuel lines.

o Trap fuel within the major fuel containers through a series of pressure-sensitive fuel-shutoff valves.

Impact of Technology

In April 1970, the first UH-1H helicopters equipped with crashworthy fuel systems began rolling off the production line. In the next 53 months, the Army had 838 accidents with CWFS-equipped helicopters, with one remarkable result--there wasn't a single thermal fatality or injury. Aircraft involved included AH-1G, OH-58A, UH-1D, and UH-1H helicopters.

During the same 53-month period, the probability of postcrash fires occurring in aircraft without CWFS proved to be many times more frequent than in aircraft equipped with CWFS. Seventy-five postcrash fires occurred in 989 mishaps of aircraft without CWFS (an average of one fire in 13 mishaps), as opposed to 16 postcrash fires in 838 mishaps of aircraft equipped with CWFS (one fire in 52 mishaps).

The dramatic success of CWFS in preventing casualties due to postcrash fires prompted the Army to embark on an ambitious long-range program of retro-fitting all rotary-

wing aircraft (except the CH-54) with CWFS. In the case of the CH-54, the magnitude of engineering changes and costs required for the relatively few aircraft proved to be prohibitive. This is especially true in view of the excellent safety history of the aircraft.

Installation into all primary Army helicopters was completed during the mid-1970's and institutionalized in Military Standard 27422B. This military standard was the basis of requirements for development of new utility and advanced attack helicopters in the 1970's, which became the UH-60 Black Hawk and AH-64 Apache. This standard continues to be used today as a requirement for all Army helicopter developments.

While the overall results of the CWFS were extremely encouraging, the Army initiated a number of product improvement actions with respect to existing CWFS. Chief among these have been the extension of breakaway fuel lines and the incorporation of shutoff valving on the engine deck area of existing helicopters. The Army also took action to develop and procure an additional shutoff valve--the main fuel vent valve--to prevent spillage of large quantities of fuel in airframe rollover situations.

During the first four years after initial fielding, the Army suffered 1089 mishaps involving aircraft not equipped

and 1083 aircraft equipped with crashworthy fuel systems. The probability of postcrash fire was approximately three times greater in aircraft not equipped (84 fires in aircraft not equipped and 25 with crashworthy fuel systems). Thermal injury was the cause of death in sixty five cases, resulted in twenty-three additional nonfatal injuries and accounted for approximately 16% of all casualties in the aircraft not equipped. In aircraft equipped with crashworthy fuel systems, only one thermal injury occurred. A passenger in a UH-1H which crashed during support to the National Forest Service was helped from the scene but had received first- and second degree burns to one arm. He was the first person in four years to receive thermal injuries in a Army helicopter equipped with the crashworthy system.

Consider what the CWFS was designed to do--provide increased strength for fuel containment, a self-sealing capability and improved plumbing to minimize fuel cell rupture or failure resulting from a crash The ultimate goal of the CWFS is to protect the crew as well as the aircraft from fuel fires caused by combat or crash damage. Postcrash fires occurring on CWFS-equipped aircraft during the study period were of the progressive type. That is, the CWFS allowed crews and passengers sufficient time to escape from crash-damaged helicopters without sustaining injuries associated with cataclysmic fires.

Crashworthy fuel systems are not designed to and cannot prevent all postcrash fires. Fires due to spillage of transmission oil or hydraulic fluid and electrical fires contribute to a continued fire hazard, along with fuel spillage in impacts beyond crashworthiness design limits. In addition, not all aircraft can be equipped with crashworthy fuel systems, either because of funding limitations or, as in the case of the CH-54, extreme mission impact compared to the benefits that would accrue. Thus, parallel to installation of improved fuel systems, the Army developed and incorporated new technology into the personal clothing and equipment of aircrews. This involved the use of fire retardant flight suits and gloves, acquisition of flight crew helmets with improved crash impact and fire retardant properties beginning in the 1960's. During one five year period, there were 64 aircraft accidents resulting in postcrash fire; during those accidents, a total of 141 personnel were exposed to fire but were specifically "saved" by the fire retardant clothing. This program continues through today. Such items involved in helicopter accidents are routinely recovered through the Army Life Support Equipment Retrieval Program and are analyzed in detail by specialists at the Army Aeromedical Research Laboratory, who make recommendations for continued improvement in those areas.

Management Oversight and Implementation of Technology

To develop a crashworthy helicopter, the effort must begin with the early design stages, as was the case during the U.S. Army's Utility Tactical Transport Aircraft System (UTTAS) development program. The fuselage must be designed to provide a protective shell around the occupants during severe crashes. This means that the fuselage must have sufficient strength, stiffness, and crash--energy absorption characteristics to prevent either collapse of critical structures or loss of retention of high-mass items near the occupants.

In addition to this crash-impact structural integrity requirement, the landing gear, airframe, and seating systems must attenuate crash-impact decelerations input to the occupant in the headward (upward) direction to humanly tolerable levels to avoid spinal injury. Except for lateral loading of side-facing seats, deceleration levels in the directions other than upward, during a potential survivable accident, are within defined human tolerance levels assuming adequate occupant restraint.

In addition to reducing decelerative loading of the seat occupant, crash-force attenuation features in a seat also reduce the loads which the seat structure must withstand. This permits a lower weight structure than would

be needed if one were to design for sufficient strength to withstand the nonattenuated crash loads.

Because the seat/restraint system is so critical to occupant survival and because its crashworthiness can be demonstrated relatively inexpensively, extensive seat/restraint system crashworthiness design and test criteria have been developed in the last 18 years.

A cost effectiveness analysis compared the total benefits to include this technology into the UTTAS program with the total costs over the life cycle of the aircraft. The total life cycle crash safety benefits were estimated as the sum of the personnel and hardware savings. These savings were compared to the projected costs of the increased crashworthiness features in the UTTAS based on Army planning figures for acquisition costs and usage rates. Crash safety benefits were projected using a range of anticipated accident rates. The cost of increased crashworthiness was estimated as a ratio of the weight of crashworthiness features to the total aircraft empty weight. This ratio was used to estimate the increase in the UTTAS life cycle costs, including both acquisition and operating costs, to provide these crashworthiness features.

The cost of crashworthy improvements was compared to the personnel and hardware benefits to determine the time required for the crashworthiness to "pay for itself." The point at which this would occur was predicted to be 3 to 10 years, depending on the accident rate. This study supported the incorporation of these crashworthiness requirements into the UTTAS prototype developments, which led to the UH-60 Black Hawk.

Subsequent Army studies provided the following major conclusions:

o Accidents constitute a significant portion of aircraft life cycle costs. Crashworthiness improvements reduce these losses in spite of increased initial acquisition costs.

o Crashworthiness improvements and other safety features are most efficiently included in an aircraft as integral systems requirements in the conceptual design stage. This design technique provides the most dramatic reductions in accident losses.

The optimum degree of crashworthiness necessary for any aircraft design is influenced by the flight profile and risk associated with the aircraft's mission as well as engineering characteristics such as the helicopter's weight

class, number and location of occupant seating and type of structural materials to be used. Therefore, the optimum crashworthiness is a balance between risks and costs (including impact on mission weight). The Army has thus published a series of "Crash Survival Design Guides" to assist Army and industry personnel determine and implement the appropriate level of crashworthiness. These design guides were ground-breaking when first published in the 1970's and continue to be updated today.

An additional aspect of oversight and management involves the Army's safety risk management process. A variety of conditions influence decisions regarding the degree of crashworthiness to built into a design. If the degree of crashworthiness to be included is less than required for a particular mission profile, then that issue is addressed by a System Safety Risk Assessment. This formal assessment is conducted by the aircraft development project manager and the document becomes part of the Army milestone decision review package. In addition, crashworthiness issues that arise after fielding are similarly addressed; issues involving high risk of personnel safety are addressed to the Department of the Army level through the Army Safety Action Team, and appropriate actions directed and decisions documented. Thus, Army processes ensure that any decisions necessary to accept additional risk are objectively reviewed and formally documented.

Recent Initiatives

Implementation of aircraft and fuel system crashworthiness has been continued, including the development and acquisition of the RAH-66 Comanche. Because of hazards associated with head and upper torso flailing injuries, an additional requirement has been identified to include helicopter supplemental restraint system ("airbag") for the Comanche crew stations. The airbag technology also has retrofit potential to existing helicopter fleets depending on the cost effectiveness of those installations.

Summary

The Army's crashworthiness technology program has spanned more than 30 years and has been characterized by many joint efforts with other services, NASA, FAA and other agencies. The success of the program is due in large part to this joint effort and was built upon the pioneering work done within those agencies in the 1940 through 1960 timeframe.

Army experience has demonstrated that accidents constitute a significant portion of aircraft life cycle

costs. Crashworthiness improvements can reduce those losses and be cost effective in spite of increased initial acquisition costs. Crashworthiness improvements and other safety design features are most efficiently included in an aircraft as integral system requirements during conceptual design. This technique provides the most dramatic reductions in accident losses.

However, even if crashworthiness is incorporated in initial design, the optimum level of crashworthiness (considering costs, weight, and benefits) may vary from application to application. Decision on the optimum level is a risk management issue addressed during the development and acquisition of the helicopter type.

Mr. WELDON. Thank you.
Mr. Healing.

STATEMENT OF RICHARD F. HEALING, P.E., DIRECTOR, SAFETY AND SURVIVABILITY, OFFICE OF THE ASSISTANT SECRETARY OF THE NAVY FOR INSTALLATIONS AND ENVIRONMENT

Mr. HEALING. Mr. Chairman, good afternoon, members. I am very pleased to have the opportunity to address the subcommittee. I have prepared a formal statement for the record and wish that it be entered.

Mr. WELDON. Without objection.

Mr. HEALING. Thank you. I will summarize some of the important features of the Navy safety and survivability program.

The Safety and Survivability Office in the Navy was created by the Secretary of the Navy in 1985 to be a part of his office after he witnessed the clear demonstration that some technologies exist in the commercial sector that were not in use in the Navy, but also had better protective properties than we were using. It was his intent to create a focal point for operational safety and survivability information in the Office of the Secretary that could also be an advocate for upgrading operational safety throughout the Navy and the Marine Corps.

Our initial efforts focused on firefighting and damage control and were related to the lessons from the Falklands war. The early efforts led us to create the current nondevelopmental item program. We call it the NDI program, not to be confused with nondestructive inspection.

After assessment by the fleet, NDI's were introduced fleetwide and led to impressive results in reducing damage from fires aboard Navy ships over the past few years. We have some statistics that will show that.

I have a chart or two. The first chart, which is also shown in my formal statement, basically talks to the difference between using nondevelopmental items and using the other process when nondevelopmental items are actually available. What we get is, a dollar through the NDI pipeline results in a dollar on the deckplates if such an item is available for use. We are very mindful, though, that there are an awful lot of military-specific systems that are just simply not available commercially and cannot be procured off the shelf. In that regard, we work very closely with our fellows at the Naval Research Lab and with the other services in their development programs.

The first big NDI success was in aviation, and this is the HEED bottle which provides a couple of minutes of breathing air to an airman who may be trapped in a sinking helicopter after crashing in the water. This is not totally Navy-unique, but it is almost Navy- and Marine Corps-unique in the sense that most of our helicopter crashes, or 50 percent, more or less, do occur in the water. Originally, it was designed for divers. It was found in a diver's shop in California by Navy and Marine Corps pilots who paid out of their own pockets to get this and make it a part of their survival kit.

We were able to take it out of the normal process and put it into service in a matter of months. The result of that was that 24 peo-

ple's lives were saved in the period of time that we saved out of the normal process; in other words, 24 people actually used this and are alive today because of it. It is only a $150 item, and the first time it was used, the person it saved was a pilot; and the cost of training his replacement was equivalent to the cost of the entire program. That was an incredible return on investment.

As much as we discovered that NDI served our needs, it was equally apparent that they could only be applied directly to some of our concerns while other challenges had to be addressed with the technology programs within the Department of Defense. We also found that systems developed by other services could be adopted for Navy NDI needs, and an excellent example of that is the flight recorder.

This you may have seen on television after Captain O'Grady crashed, and when the television pictures were taken of the crash site, this was the device that was shown there. It was out of an F–16. But the Air Force developed this technology and spent their money getting it to the point where it was small, compact, and very lightweight, which had not existed previously. That was an outstanding development that was badly needed by all of us, and for the Navy's purposes, however, it was a nondevelopmental item, although it did come from the other service. We found it to be extremely important to talk to one another and find out what they are doing and to jump on their train, if you will.

For Desert Storm, we responded to an urgent request from the fleet for previously assessed nondevelopmental items in damage control and firefighting. Seven days after the request for help, critical items started showing up on the docks in Norfolk. Industry had responded quickly to our needs. And on the 17th of February, the *Tripoli* struck a mine, just 3 weeks after receiving their NDI package, in the Gulf area. The ship's captain told everyone involved that his heroic crew was helped by the NDI's they had received, especially Ramfan.

I have some additional NDI's that represent typical areas of interest for the Safety and Survivability Office. In terms of helicopter crashes, one of the other systems that was used was called HELS, which is helicopter emergency lighting system, designed to go up—and let's see if it comes on. Well, that is not HELS. That is a nondevelopmental item that does the same thing. When the lights hit the water—there you go. When the lights hit the water, they come on, and this is a $10 item. It was available off the shelf, but not manufactured in the United States. Our HELS lighting program finally went forward, but it was a very thoroughly engineered program and was quite expensive by the time we were done. This was not known to exist at the time, and unfortunately, we were not able to take use of it.

The firefighter's ensemble, if I could ask Mr. Croason to show you the Navy firefighter ensemble, which is on the table over there, is an adaptation that we made following the *Stark* incident. By the way, these were very rapidly implemented in the fleet. We worked with OPNAV resource sponsors and NAVSEA and Naval Research System in order to put together a suitable suit which used state-of-the-art technology, as you might find in the local fire departments, and make it so it would be useful to the Navy.

We also had a commercial off-the-shelf firefighter's helmet which replaced the steel pots left over from World War II, essentially, and took advantage of kevlar and other material advances.

Another item was the fire finder. This complemented the NFTI, or the Navy firefighter's thermal imager. It is a far less expensive flashlight-sized device which, when you turn it on, it will find a hot source. It will indicate where the fire is so that the firefighter in a smoky environment would be able to locate where to apply his extinguishant.

In order to develop a focus for our efforts, we decided we needed to know where our mishaps and losses were occurring. In the years following Desert Storm, we found that aviation is the area where opportunity is the greatest. The next graph shows that from fiscal year 1990 to 1994 we totaled up all the mishap/losses and displayed them in two pie charts. On the left-hand side you see the dollar losses and on the right-hand side the fatalities. It is quite clear. Aviation, which is shown in red, is the area where we have the greatest opportunities to improve. It is not surprising, because of the cost of aircraft, that it is a very high number over there. However, it was quite obvious to us that if we put our money and our efforts and our intent in this direction, we had the greatest opportunities to make improvements.

For example, one of the improvements that is being worked on right now is an advanced technology demonstrator. Currently going into contract for the H–53 on an integrated mechanical diagnostic system. It is similar to what the British have designed called HUMS. It is more than that, actually, and includes a voice and data recorder. As far as we are concerned, that is one of the most important things that we can have.

My office also has sponsored a nondevelopmental item demonstration of mechanical diagnostics technology in San Diego. It turns out that we were able to invite industry to participate with us, it turns out, as a no-cost demonstration for the Navy of an outstanding technology.

In order to know whether we are doing better or not, we took a look at the summary of those years, and I put them on a bar chart here. Probably the most significant thing is to relate the aviation to the shore side and the float, which includes both surface and subsurface. As a direct result of the inputs from your committee back when the Seapower Subcommittee helped us out in the 1987–88 timeframe, you can see the bottom, the very bottom line, the darkest one on there, is the surface ships and submarines total losses over the period from 1990 to 1995. It is a steadily decreasing loss, and this is a direct tribute, I think, to the improvements that were made.

The aviation obviously, again, is still our area of challenge, which is the red columns on that.

Let me turn back to ships, if I may, for a moment and address the fact that on the *Shadwell,* the Naval Technology Center for Safety and Survivability, which is at Naval Research Lab, operates the *Shadwell* in Mobile, AL, and we have been involved with that and aware of what they are doing much of the time. Using the reformed acquisition process, the Navy now is in contract to buy an off-the-shelf replacement for the P–250 pump. The new PP–100

pump represents the best-value approach, using commonly available technology from civilian sources.

We are also getting close to replacing the OBA, and I am certain you want to know more about that effort. The 60-year-old technology has been reliable for decades, but newer technologies in use for years in civilian fire companies offer a chance to upgrade and get away from mil spec item used in old technology. Cooperating with OPNAV, NAVSEA, and CINCLANTFLT NDI facility, we are outfitting one complete ship this year as a full-scale demonstration that will identify problems we might have to face with compressors, bottle storage, and refilling procedures. Once that is done, we expect to go fleetwide, and the fleet is very excited about this upgrade.

In closing, I want to mention that Secretary Dalton did name the Safety and Survivability Office a reinvention lab under the auspices of the National Performance Review and the DPR. This status, I believe, will enhance our ability to be responsive to fleet needs and recognizes the cost-effectiveness of employing the NDI process wherever applicable, along with our efforts to streamline the acquisition process, especially for operational safety systems.

I thank you for the opportunity to address you and will be here for your questions, sir.

[The prepared statement of Mr. Healing follows:]

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SECURITY COMMITTEE

DEPARTMENT OF THE NAVY

STATEMENT BY

RICHARD F. HEALING, P.E.

DIRECTOR, SAFETY AND SURVIVABILITY

TO THE

SUBCOMMITTEE ON MILITARY RESEARCH AND DEVELOPMENT

OF THE

HOUSE COMMITTEE ON NATIONAL SECURITY

3 AUGUST 1995

NOT FOR PUBLICATION UNTIL
RELEASED BY THE HOUSE NATIONAL
SECURITY COMMITTEE

NAVY DEPARTMENT OPERATIONAL SAFETY AND SURVIVABILITY

Mr. Chairman, Members of the Research and Development Subcommittee, I am Richard Healing, Director of Safety and Survivability, Office of the Assistant Secretary of the Navy (Installations and Environment); and it is my pleasure to present information on the Navy Department's unique operational safety and survivability program. There are many emerging opportunities in the area of operational safety and survivability, and I will be describing our plans and methods of taking advantage of them. Before addressing the Safety & Survivability program, I would like to frame the issue by defining the relationship and differences between operational safety/survivability (S&S) and occupational safety and health (OSH).

OPERATIONAL SAFETY & SURVIVABILITY

Military operations and combat training are unquestionably "high risk" evolutions in which military operational commanders are both responsible for, and accountable for, risk management and loss avoidance. In such high risk activities, operational safety is maximized when military commanders have effectively employed the risk management process (Figure 1) to reduce risks to acceptable levels. Operational losses or operational fatalities can occur when risks are improperly assessed or not managed. The requirement for risk assessment and risk management is both essential and pervasive. In addition to the military commander's responsibility, every Soldier, Sailor, Marine or Airman is individually responsible for incorporating dynamic risk management methodology in the process of mission performance. The goal of any operational safety effort is maximum mission performance with zero operational losses. This is accomplished through risk assessment and risk management, or risk reduction.

THE RISK MANAGEMENT PROCESS

- Identify Hazards
- Assess Risks
- Decide
- Implement Controls
- Supervise

Figure 1

By comparison, occupational safety and health (OSH) programs address the hazards and risks associated with "industrial" work place activity, where hazards can be eliminated and "risks" can be avoided. OSH programs typically include comprehensive rules and enforcement provisions, enacted through legislation. Compliance with these rules generally minimizes risk, making a safer work place.

Many of the hazards in combat, and at least some of the risks taken in military training, are created or influenced by potential enemies' capabilities. In combat, risks are assessed and "managed" in a very dynamic environment; and risk management principles are applied when a

hazard must be faced to gain or maintain military advantage that results in victory or survival. In addition to potential enemies' capabilities, management of the inherent risks in our own systems defines the opportunity for advantage. In actual combat, eliminating hazards or avoiding risks posed by an opponent is simply not an option. Conversely, in an industrial workplace situation, there is always the option of not performing a task if the risk is deemed unacceptably high.

Operational safety and survivability is the result of training readiness, equipment readiness, sound leadership and informed decision making in the face of hazards and risks that we haven't created, don't fully control and can't walk away from.

NAVY SECRETARIAT S&S PROGRAM

"Safety First; Paperwork to Follow" and "Tomorrow is Too Late if We Lose a Sailor, a Marine or Equipment Today" are phrases used by Captain Joseph K . Taussig, Jr., USN (Ret.), founder of the Navy Department Office of Safety and Survivability in 1985, to address the urgency of operational safety programs. A Pearl Harbor veteran and hero, who fought numerous fires and flooding aboard his ship, USS NEVADA (BB-36) on December 7th, 1941, Captain Taussig never forgot the lessons of that fateful day. His devotion to the Navy and its Sailors never wavered, and he dedicated his life to continuing the battle against fire aboard Navy ships.

In addition to fire fighting and damage control, the current S&S staff expertise in personnel protection and Chemical-Biological-Radiological warfare, mechanical engineering and chemical engineering, aviation and aeronautical engineering, business and manufacturing experience, and combat experience. From these diverse backgrounds, the office addresses all of the traditional Navy "communities" - aviation, surface ships, submarines, shore facilities and Marine Corps - closely coordinating with the OPNAV resource sponsors and Systems Commands. Initial efforts focused on the Falklands War lessons and ways to improve damage control and fire fighting aboard ships. In the process, it was discovered that the term "survivability" held little meaning for the average Sailor, so "safety" (meaning operational readiness safety) was added to the title for clarification.

LESSONS LEARNED

In 1982, lessons from the Falklands War provided new dimensions and added urgency to the effort to eliminate fire as a major threat to our ships and improve our Sailors' chances to survive and continue to fight in even the most threatening conditions of modern combat. When HMS SHEFFIELD sank following a single Exocet missile strike, it was clear that modern warships could be destroyed by fire following even the smallest of warhead explosions. In the months that followed the Falklands War, many off the shelf technologies were found that could improve the fire resistance of our ships and things aboard them, and the firefighting capabilities of the crews. When faced with fire at sea, a Sailor needs every advantage there is, because there is no acceptable alternative to putting the fire out.

By 1985, materials had been found that could withstand a 5000 deg.F fire - typically, the

temperature of Class A (combustible non-petroleum) or Class B (petroleum) fires is around 1800-2000 deg.F. Means of treating existing fabrics and materials were also discovered, providing ways to improve survivability without replacing things. Technologies like these were demonstrated to the Secretary of the Navy, who promptly recognized the potential for improvements in survivability from implementation of state of the art technologies. Within weeks, the core of the current office was in place, with the initial goal of taking steps to improve shipboard fire fighting and damage control, through state of the art and emerging technologies.

FOCUS ON NDI/COTS

To respond to Fleet needs as quickly as possible, the office focused on Non Developmental Items (NDIs), and Commercial Off The Shelf (COTS) equipment. Captain Taussig's reputation throughout the Fleet ensured acceptance at the senior officer level; and the S&S office was readily given direct access to ships for assessment of NDI/COTS answers to their S&S challenges and problems. This formed the critical first step toward a more comprehensive NDI/COTS effort that was to pay significant dividends during Operation DESERT STORM.

The complete history of the Secretary of the Navy's Safety and Survivability program would take far too long to document in this statement; but it should be noted that continued existence of the S&S program to date has been dependent on cost effectiveness (Figure 2) and documented successes that have saved lives and property far exceeding the costs of having and maintaining the S&S effort.

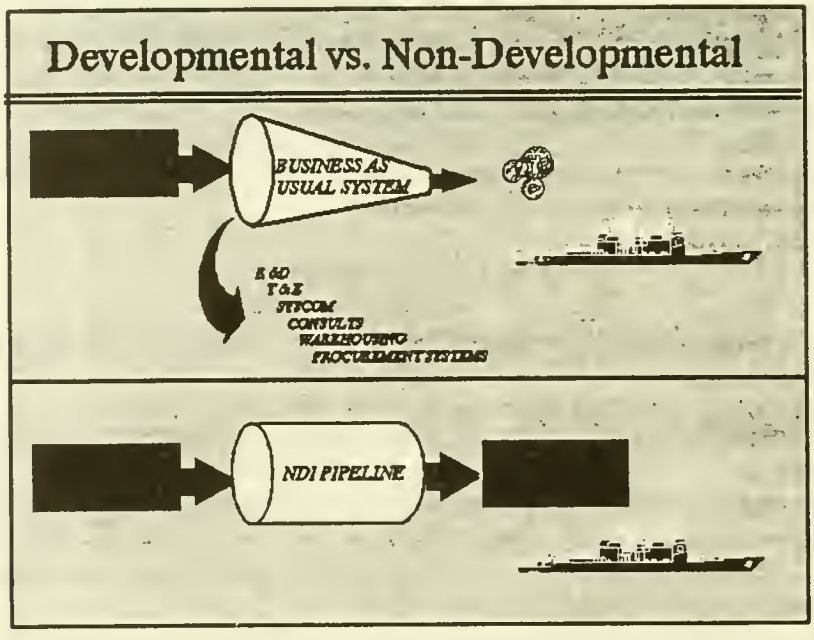


Figure 2

The S&S NDI program began as an idea to implement state of the art or advanced technology, from any source, into the Navy if it provides an improvement over existing equipment or technology. Perhaps the best way to demonstrate the value of this effort is to briefly describe a few of the successes.

HEED SUCCESS STORY

On 15 October 1985, a mere two months after the S&S office was "created" by the Secretary of the Navy, a Marine H-46 helicopter crashed at sea, with 15 fatalities. This tragedy immediately brought our attention to S&S programs that addressed personnel survival in this type of operational training mishap. One program was called HEED (Helicopter Emergency Escape Device), which involved a small and simple $150 compressed air bottle that could provide about 2 minutes of breathing air to someone trapped under water. After a quick review, it was apparent that the NDI/COTS HEED was at the very least "good enough" to be introduced to full Fleet use immediately, and about 3 years earlier than "business as usual", by adopting streamlined acquisition and logistics strategies. As a result, HEED was bought for the Fleet in 1986, and its first actual use occurred on 27 August 1987 when a Navy Sea Knight crashed into the waters of the Indian Ocean. Two survivors of the 1987 mishap credited HEED with saving their lives. More saves were to follow; and by November 1989, the original fleet introduction date, 24 people had been saved by HEED. In terms of cost effectiveness, the entire HEED program was fully paid for by its first "save".

In the Navy, HEED was transformed for use on surface ships, as a supplemental breathing device for use in fires or other circumstances involving unbreathable air. HEED has also "migrated" to the Coast Guard and other services, including the USAF and ARMY; and it continues to save lives today.

DESERT STORM NDIs

Another success story was based in Norfolk, Virginia. The S&S NDI program had expanded with the creation of a NDI Facility at Norfolk, under the cognizance of the CINCLANT Fleet Maintenance Officer, who is a Navy admiral. The small force of senior enlisted people attached to the CINCLANTFLT NDI Facility greatly expanded the S&S office's ability to search out answers, and to match them to the needs of the ships assigned to the Atlantic Fleet. A small amount of funding was made available to buy S&S NDI/COTS items for Sailors to try out under real shipboard conditions. This "buy and try" process completely bypassed time-consuming, expensive RDT&E evolutions that normally preceded any equipment introduction at the Fleet (deckplate) level. The ships' forces soon realized that they could bring new technologies they discovered to the attention of the NDI facility, and they would soon get to try that same technology out on their ships, courtesy of the S&S NDI program. In the period from 1987 through 1990, several damage control and fire fighting technologies were bought this way, assessed in the Fleet by Sailors, and reported on through the CINCLANTFLT Maintenance Officer. In 1990, the value of having done these assessments became critically obvious.

Following the Iraqi incursion into Kuwait on 2 August 1990, the CINCLANTFLT

Maintenance Officer sent an urgent request to the S&S Office; seeking help in getting 8 damage control and fire fighting NDIs for all the ships that were in the Persian Gulf, and those scheduled to go. Because the S&S NDI program had already assessed them, the 8 requested items had proven value toward enhancing the safety of Sailors and survivability of ships in combat; and it became a matter of finding resources to get the proven NDIs to the Fleet in very short time.

Two days after the request was received, funds were identified. An additional two days were required, working closely with the Naval Supply Systems Command, to write and issue the required contracts. Three days later, deliveries of the 8 critical S&S NDIs began in Norfolk. Each item was test run or appropriately inspected by the NDI Facility crew. A training video was made and shipped with the 8 NDIs in the special, tri-wall, shipping container. The containers were coated with red dyed fire retardant material, making them very easy to locate among the vast collections of supplies sent to the Gulf area during the DESERT SHIELD phase. A "Tiger Team" was sent to the Gulf to train ships' forces in the operation of the new equipment. The entire stateside effort was complete in 45 days. Distribution and training in the combat zone was complete by the end of January 1991.

On 17 February 1991, the USS TRIPOLI (LPH-10) struck an Iraqi mine, suffering threatening damage to the ship and its hundreds of personnel. Several of the recently received NDIs were put into use; one of them, the "Ramfan", was credited by the TRIPOLI's Commanding Officer with significantly assisting his heroic crew in saving their ship from exploding or sinking. The TRIPOLI became the first United States warship in 125 years to survive a mine hit and continue performing its mission.

A month later, Admiral Leon A. "Bud" Edney, Commander In Chief, U. S. Atlantic Command, observed in a letter to the Secretary of the Navy, that the safety and survivability equipment delivered to the Persian Gulf ships "...stood out as innovative and first rate in the application of 'off-the-shelf' technology..." that "...made a great difference in increased safety and survivability for our sailors on the front line ...", and that this effort represented "... the best return on the dollar I've seen for all our damage control teams and personnel." In a 1992 Report to the President and the Congress, the Secretary of Defense identified 9 NDIs that made a difference in the Gulf War - 8 of the 9 were from the Navy's S&S office.

FIRE FIGHTING NDIs

Many of the early efforts of the S&S office produced NDIs that applied to fire fighting and damage control. Among them, several stood out for significant improvements that have made it possible to change the fire fighting doctrine. The Fire Fighters Ensemble (FFE) is a state of the art "jumpsuit", constructed from the same materials found in civil fire fighting companies. It replaced dungarees, and makes it possible to approach fires in a much different way. The Naval Fire Fighters Thermal Imager (NFTI) is an NDI developed for the Royal Navy following the Falklands War. NFTI "sees through" smoke, enabling fire fighters to perform rescues and direct fire fighting efforts knowing where the fire actually is located. Kevlar helmets have replaced the "steel pots" left over from World War II as the fire fighters helmet. All of these NDIs have contributed to real success in Naval firefighting aboard ships. There are many more

examples of past success; but other aspects of this effort can provide insight to potential future achievements through dual use concepts.

ONGOING NDI EFFORTS

A current, major NDI/COTS replacement effort is a damage control/ fire fighting pump that will eventually replace the reliability-plagued P-250, which has served for many years as the primary portable pump aboard ship. The new NDI pump is powered by safer JP fuel, instead of gasoline, adding to the safety improvements. The S&S office bought this and other NDI pumps for Fleet "user"assessment in 1992. Following fleet determination and advanced testing at the Naval Research Lab, under the auspices of the Naval Technology Center for Safety and Survivability (NAVTECHCENSAS), the Naval Sea Systems Command constructed a "best value" acquisition strategy; and with funds provided by the resource sponsor, a contract was awarded this year.

Another major improvement in the fire fighting and damage control area will replace the Oxygen Breathing Apparatus (OBA), a 60 year old design, which served the Navy well for decades, but has reached obsolescence. In partnership with OPNAV and the CINCLANTFLT NDI Facility, a large scale demonstration will install standard COTS Self Contained Breathing Apparatus (SCBA) in all the repair lockers aboard one ship this year. This is the third phase of a demonstration where Phase I was a simple S&S NDI assessment; Phase II was a larger scale shipboard assessment involving 18 SCBA units aboard the USS KIDD. User assessment results were so positive that it was determined that a full ship should be done right away, with plans to proceed to fleetwide replacement as soon as the large scale assessment is complete.

The S&S office recently initiated a new database for Condition Based Maintenance (CBM) technologies. CBM has huge potential for reducing maintenance costs; and in terms of safety and survivability, CBM can practically eliminate catastrophic failures that can cause mishaps. CBM technologies are common in industry, and available as NDI/COTS technologies available for Navy implementation wherever appropriate. Consistent with efforts to transition toward CBM, the S&S office has worked closely with industry and fleet units located in San Diego, to demonstrate state of the art monitoring and diagnostics equipment for helicopters. Using a CRADA (Cooperative Research and Development Agreement), a "no cost" demonstration has already indicated significant potential savings in maintenance costs, with the added benefit of early warning of potentially catastrophic failures.

INVESTMENT STRATEGY - PRIORITIZING

Careful shepherding of the small amount of funding provided (less than $1M annually) for the S&S NDI "Buy & Try" effort has produced significant results. (For perspective, the average "investment" in any single program is less than $25K.) In order to identify the best investment opportunities and prioritize distribution of these funds, we have taken several actions, including two studies that focused our current efforts.

OPERATIONAL LOSSES FY90-FY93

In early 1994, we reviewed both Navy and Marine Corps operational mishap data from the records at the Naval Safety Center in Norfolk, for the period including FY90-93. (Graph 1) The data was separated by community (aviation, afloat, shore), and displayed in graphical form. This enabled us to clearly see the areas with the greatest losses, and their relationship with losses of other communities. (Graph 2) Analysis helped focus our efforts to reduce the number of mishaps, including identifying the specific community which would benefit most from support in resources. Aviation experienced the greatest losses of life and assets; and we recognized the need to focus our support for the aviation community's planned upgrades and safety improvement efforts. Bringing our NDI/COTS concepts to bear on identified safety issues, and aggressively seeking out emerging technologies that might be of help, we are currently working closely with our aviation community to take advantage of all opportunities for reducing aviation losses. Certainly, the high cost of aircraft and the probability of total loss (vice repairable loss) in an aviation mishap seem to twist the statistics; but focusing has caused us to take a critical look at emerging NDI/COTS opportunities that can directly reduce the number of fatalities and mishaps and extent of injury or damage. We are pleased with what we are finding.

SURFACE SHIP SUCCESS

In the same study, it was apparent that afloat communities, surface and submarine, experienced a strong and steady downward trend in losses. (Graph 3) The submarine community has been very safe for a long time; and the surface ship community improved dramatically since the 1982 Falklands War, which stimulated intense fire fighting and damage control improvement efforts within the Navy, and the 1987 USS STARK incident when Congress responded by quickly providing critical resources that directly improved the Navy's damage control and fire fighting capability during the past few years. For example: in FY90 surface ships mishaps, fires caused $57.6 Million in damage, equal to 62% of the $93M total losses from all causes; in FY94, fires caused less than $1.2 Million, only 5.7% of the $21M total from all causes. The trend had been steadily downward through the 5 year period, reflecting the value of focusing attention and taking action to address an identified problem.

AVIATION FOCUS

The second study was performed by an independent contractor, and focused on aviation losses because Naval aviation had experienced increasingly costly losses. The study analyzed mishaps with respect to three specific, NDI/COTS, safety-of-flight systems. Analysis established "statistical" impact values, in terms of "dollars saved" and "lives saved", for each of the three systems, and for each of the mishaps reviewed. System costs were then weighed against these "benefits", and a "payback" was determined. To validate the mishap data used for the study, fleet aviators were invited to the Naval Safety Center, reviewed each mishap report, and the final product was adjusted to reflect their inputs. The resulting "cost-benefit" values, identifying specific NDI/COTS systems with specific platforms, indicated the best investment strategy for maximum reduction of losses. As an example, a fully functional Ground Proximity Warning System (GPWS) on an attack helicopter would pay for its cost in less than 3 years, through

reduction of mishaps. Across the full spectrum of platforms and systems, the general payback period was from 2 to 4 years - mostly from prevention of mishaps, and from reduced maintenance costs in the case of the diagnostics systems. The best payback was about 6 months for a data recording and diagnostics system on SH-60 helicopters.

"REINVENTION LAB"

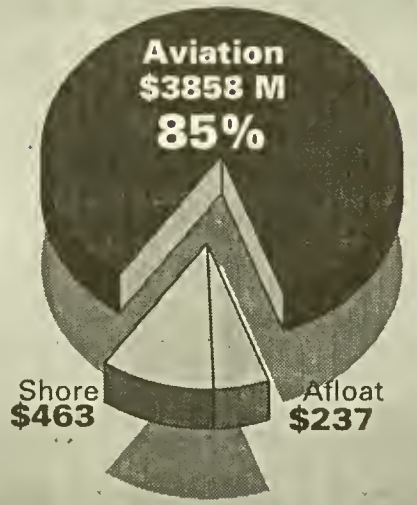
In January of this year, Secretary of the Navy John Dalton designated the S&S Office a "Reinvention Lab" under the auspices of the National Performance Review (NPR), on the basis of achievements in streamlining acquisition of S&S items. This designation further enables us to identify and pursue new ideas for cutting "red tape" and improving customer service. Close ties have already been established with the Naval Postgraduate School in Monterey, which is the lead Reinvention Lab for the CNO. The benefits of Reinvention Lab status will directly enhance our NDI/COTS efforts.

FUTURE

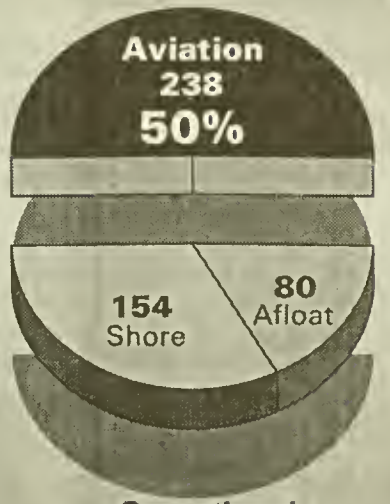
S&S NDI/COTS efforts cover the spectrum of Naval activity and, through networks, well beyond. Future projects include Color Night Vision System (CNVS), Virtual Retinal Display (VRD); Human Factors analysis and Risk Analysis; Fixed Wing Attack study (similar to the helo study); enhanced crew systems for all communities, including improvements in S&S related medical readiness. Advanced fire fighting technologies, including water-mist, charged injection and gelled water, along with Halon replacement efforts, and material technologies are planned or underway. Cooperative efforts include aircraft systems upgrades (FAA; airline pilots), CBR personnel protection projects (other services), and even consultation with the Department of Interior on wildland fire fighting. The S&S NDI database, which now contains over 4,300 manufacturers and 15,000 items, will continue to grow as emerging products come into the market.

Our "customer", on average, a 19 or 20 year old Sailor or Marine, willing to sacrifice his or her life in defense of our country,is able to put to use only those tools we provide to them. Since these "users" are also, on average, brighter than their predecessors, we can only gain by keeping the door open to their innovation and creativity, letting their common sense and judgement guide our own efforts. We can never lose sight of the notion that if we take care of these "customers", they can perform the missions assigned to them, and the taxpayers will have received from our efforts the value they have every right to expect.

FY90-94 Navy/Marine Mishap Losses



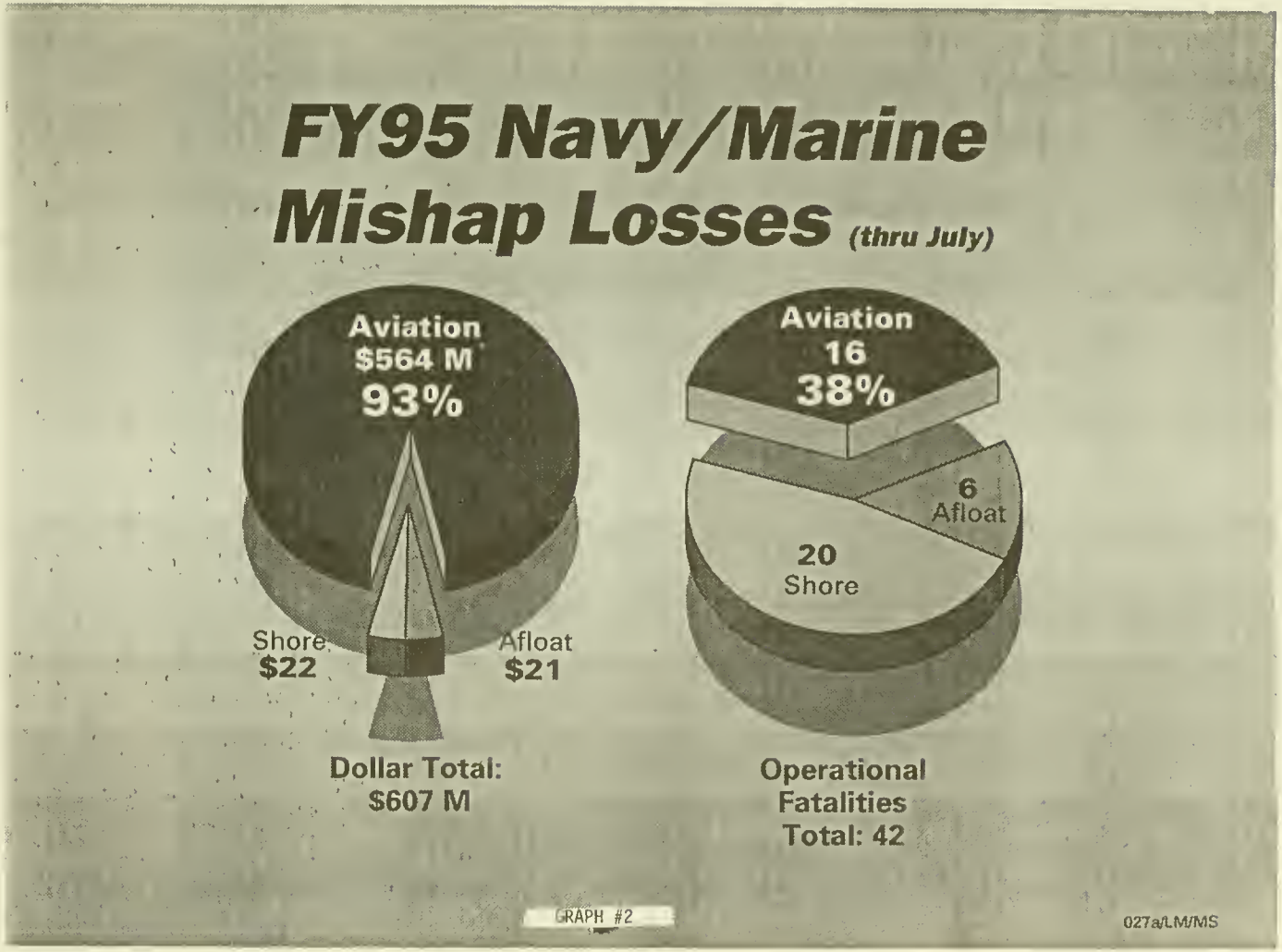
Dollar Total:
$4558 M

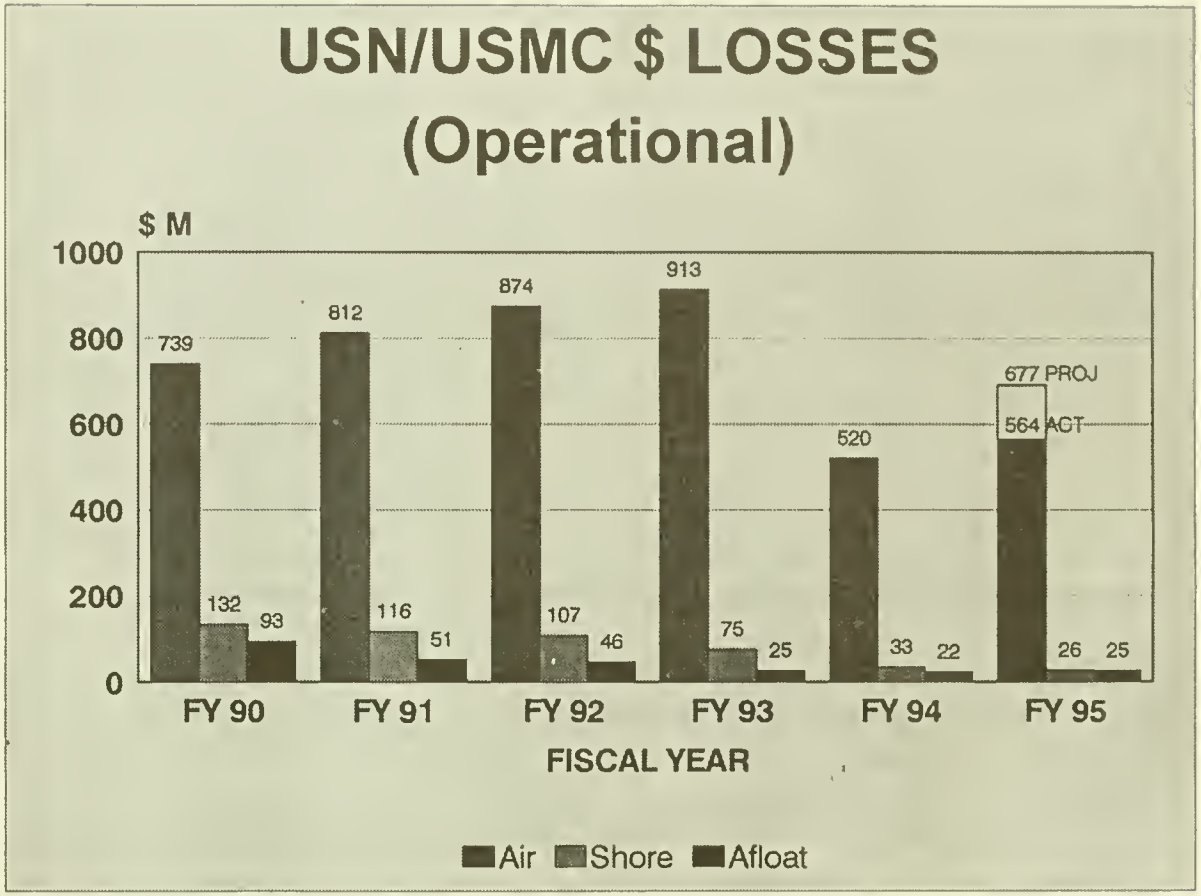


Operational
Fatalities
Total: 472

GRAPH #1

028/LM/MS


FY95 Navy/Marine
Mishap Losses (thru July)
Aviation
$564 M
93%
Shore
$22
Afloat
$21
Dollar Total:
$607 M
Aviation
16
38%
6
Afloat
20
Shore
Operational
Fatalities
Total: 42
GRAPH #2
027a/LM/MS


USN/USMC $ LOSSES
(Operational)
$ M
1000
800
600
400
200
0
739
132
93
812
116
51
874
107
46
913
75
25
520
33
22
677 PROJ
564 ACT
26
25
FY 90
FY 91
FY 92
FY 93
FY 94
FY 95
FISCAL YEAR
Air
Shore
Afloat

GRAPH #3

Mr. WELDON. Thank you, Dick, and I thank all of you for your testimony and your statements, which are in the record.

I have a number of questions. I am only going to ask one or two and let the members ask, and then I will come back at the end to ask the other questions I have, and I will submit some for the record that are more detailed.

I might acknowledge that my good friend from Texas handed me a note saying this is a typical Weldon hearing with all the gadgets and gizmos. I did not ask them to bring all that stuff in here. [Laughter.]

Mr. WELDON. But we welcome the evidence of the good work you are doing.

We did in our authorization bill in the subcommittee put in an extra $4 million to enhance R&D activities in personnel safety and survivability above and beyond what the administration requested. We also had an additional $20 million specifically to allow you all to buy off-the-shelf items wherever you think the priorities are, much like you have been doing, Dick, in the Navy.

But I guess I would want to know, do the other services need a similar type of capability? First, I do not know whether you have the same visibility within the service that Mr. Healing has in the Navy at that level. Do you have that? Do you need that? And do you need the capability to be able to buy off-the-shelf items such as the Navy has been doing? And have you been doing that, in fact? I would ask the Air Force and the Army both that question.

General PAUL. I believe we do have that capability. As I mentioned, 90 percent of our equipment procurements are from the commercial sector.

Mr. WELDON. But is there an expedited process that you can go out and get it immediately?

General PAUL. To my knowledge, it is. I would be glad to take that for the record and get back to you with some specifics on the time line.

[The information follows:]

FIRE FIGHTING RDT&E FUNDING

Yes; the Air Force labs use three small purchase rapid procurement vehicles:

Micro purchase Impact Card (i.e., a credit card), maximum allowed $2,500, time required 3 hours.

Purchase order, maximum allowed $2,500, time required 3 days.

Small purchase, maximum allowed $25,000, time required 2 days.

(Purchased through the Electronic Data Information (EDI) system.)

Small purchase, maximum allowed $50,000, time required 7 days.

(This requires Federal Acquisition Computer-network certification; an EDI equivalent of the Commerce Business Daily.)

Larger off-the-shelf purchases of laboratory equipment could be procured in about 30 days.

Mr. WELDON. OK. It is my understanding, Dick, you have that ability immediately; correct?

Mr. HEALING. Yes, sir, we do.

Mr. WELDON. That is a matter of days, not a matter of months or specs and all that stuff.

Mr. HEALING. Yes, sir. In fact, 2 days is the normal timeframe to issue a contract.

Mr. WELDON. I am not asking the question to be critical. If you do not have that, I want to see if we can give it to you. How about the Army?

Mr. HICKS. Yes, sir, we have the same capability to buy off the shelf, in fact have. An example, some years ago there was a requirement for a particular light, a so-called lip light and finger lights to be used by UH–60 pilots to find the radio controls under night-vision-goggle conditions. The requirement for this arose out of an incident that we had with one of the Black Hawks. We have an Army safety action team, which is chaired by the Deputy Chief of Staff of Logistics, Headquarters DA, made up of members from the program executive office aviation, the aviation branch chief, the operations—all the principal staff at Headquarters DA. That group identified the requirement, identified it as a high risk, and the program manager went out—in fact, the Deputy Chief of Staff of Logistics went out and bought those, and the only limitation at the time was simply how quickly could industry respond to that procurement. So, certainly, we have the capability to buy off the shelf.

With respect to the requirement for some centralized focus, each service has a somewhat different culture in acquisition and management philosophies. Within the Army, we have chosen to integrate those safety and survivability acquisitions into our acquisition process. As a matter of fact, the military deputy to the Assistant Secretary of the Army for Research and Development Acquisition is very actively and personally involved in safety and survivability issues. I have personally sat in his office and on multiple occasions been told this is what the Army is going to do on particular occasions. He has staff that is specifically focused on safety and survivability. In fact, I just ate lunch with that lieutenant colonel in that regard today.

Mr. WELDON. That is at the Secretary's level?

Mr. HICKS. That is correct, sir.

Mr. WELDON. Does the Air Force have that same level of access to the Secretary on these issues?

General PAUL. Yes, sir.

Mr. HICKS. So even though our——

Mr. WELDON. Do you all meet periodically to work together and coordinate and cooperate?

General PAUL. We meet through the Reliance mechanism that I told you about on a regular basis.

Mr. HICKS. That is, I think, if I could, the way we integrate at the technology level. Then, of course, I am from the Army Safety Center, somewhat different from these other individuals here. We communicate across the services at the joint safety chiefs level.

Three months ago, the flag officers, the safety chiefs for each service, met to address common interests, flight data recorders being one of them. As a matter of fact, the next meeting is at Kirkland Air Force Base in November. That is an organized, relatively formal process for communicating across the safety communities.

Mr. WELDON. One final question before I turn it over to my colleague Mr. Spratt. Is there a formal process in place in each of the services in a central location to identify on an incident-by-incident basis, when loss of life occurs, when injuries occur, so that it comes

to a central reporting center for analysis purposes to then directly relate your loss control and loss prevention activities into what is occurring in terms of the losses? First of all, is that in place in each service? Where is it headquartered? And is that data shared across the services so that you can look for trends, as we heard Mr. Healing talk about the focus on aviation in the Navy because that is where the losses were occurring? Is that process formal? Where does it end up? And is it shared across the services so that they can look at DOD and develop kind of like trends servicewide?

Mr. HICKS. Yes, let me take that. Yes, the capability is in each service. It is centralized. Each service has a safety center. I am at the Army Safety Center at Fort Rucker, AL. The Navy Safety Center is at Norfolk, VA, and the Air Force Safety Agency is at Kirkland Air Force Base, NM.

Mr. WELDON. So then you could provide for us pretty quickly the total number of incidents that occurred, say, in the last fiscal year, how much there was in the way of loss of life, what caused the loss of life, what kinds of injuries occurred?

Mr. HICKS. Yes.

Mr. WELDON. And what kinds of, say, fire loss occurred or property loss from other incidents and then you analyze that and come up with trends and then take resulting action from that?

Mr. HICKS. That is correct, sir. What we do is we have teams that go out and investigate all Class A accidents. I am speaking now with respect to the Army processes. We actually send teams out. When an accident occurs, 2 hours later there is a phone call in our office. We have teams on the go that have their bags packed. They go and investigate that accident for the command. We then define Department of the Army level recommendations out of that investigation, and then we forward those recommendations to the appropriate commander, whether it is in the acquisition side or in a training issue or even other Federal agencies, such as the National Weather Service.

Then we follow up on those recommendations. We have a system whereby we make sure things do not fall through the crack. We also share data with the other services where we are chartered to do so under the Department of Defense instruction, and, in fact, we do on common items. All the services use H–60 helicopters, for example, and we do share data across the safety centers on H–60's, for example, and that also applies to other systems in common.

As I said before, at these joint safety chiefs conferences that occur approximately quarterly, we also share data on specific items of interest, for example, human error. All the services typically have 80 percent of the accidents due to some aspect of human performance, so we share problem areas there and solutions at that level across systems.

Mr. WELDON. Is there anyone in DOD that kind of coordinates that and looks at the big picture?

Mr. HICKS. Yes, sir. The Office of the Secretary of Defense for Environmental Security, under that office there is a principal deputy, Mr. George Siebert, who is the designated safety and occupational health official for the Department of Defense. That title is meaningful in terms of the public law. Each Federal agency is to designate such an official, and Mr. Siebert is that person. He has

a small staff on the Office of Secretary of Defense who assists him in coordinating safety-specific issues, and we are in contact with him on a daily and weekly basis.

Mr. WELDON. Do either of you want to add anything to that? You are in agreement.

Just to follow up on that—then I will end my questions for now—in industry they have a similar type process in place, but the problem is in industry that you have a focus on safety and loss prevention and loss control, but when budget cutting time comes, that is the first area that is cut across the board. And I have seen that because I worked in industry for 10 years in that capacity for a large insurance company in their risk management operation. Do we have the same problem in the service where you know what the problem is and you know what needs to be done, but because of the budget constraints that are being placed on you now, perhaps you do not have the level of visibility or perhaps it is—you know, we need to maintain the O&M accounts; we need to buy that new piece of equipment; so, therefore, the safety issue and priority tends to get pushed back. You are the people that are responsible for this, and I do not want to get you in trouble with your bosses and superiors. But this question needs to be asked, because I want to try to provide focus for you all and I need to know candidly, honestly. Is it the same thing that happens in the service that happens in industry? Do you tend to be squeezed first?

Who wants to go first with that one?

Mr. HICKS. I will take it. Every organization, every large organization, has the same pressures, whether it is industry or Government. Speaking with respect to the Army, there are some key things that are designed into the institution to counter that.

My boss, the Director of Army Safety, report directly to the Chief of Staff of the Army. That has not always been that way. As a matter of fact, it has not always been a general officer billet. But in 1984 it was made a general officer billet. In 1987 it was moved to respond directly to the Chief of Staff. As a result of that, and then on through the organization, the same thing occurs at different levels of the Army organization.

That is a key point to counter the pressures to downsize and cut safety. There are multiple occasions when issues have had to be brought directly from Army Safety to the Chief of Staff of the Army, and in every case, the attention, the appropriate actions were taken. And the dialog in both cases—when my phone rings, it could be and has been the Chief of Staff of the Army asking about a specific issue on a helicopter, a tank, or a truck, or whatever. With that visibility, our organization is able to counter that threat.

Mr. WELDON. The reason why I ask that question is we get calls frequently on more money for the Comanche, more money for the V–22, more money for the B–2 or whatever the program is. I do not ever remember in 9 years getting a call saying, Can you give us more money for safety? Can you give us more money to buy some equipment for personnel safety?

It is not the sexy issue. It does not have, perhaps, the lobbying visibility, and I just want to make sure that in the service we have

that effort underway that is making sure that those priorities are being addressed.

General, what about the Air Force?

General PAUL. I cannot respond with specificity. I am not from our safety organization. But we do have a safety agency. They are charged with keeping track of safety in those incidents, and, of course, I know my new boss, General Viccello, has put a top priority on safety and made that crystal clear, in 30 minutes of comments to his commanders, highlighted that one specifically as a half dozen that he put right at the top of his list.

Mr. WELDON. Good. Mr. Healing.

Mr. HEALING. I believe that the priorities that have to be set ultimately do get set with full consideration of safety. In the Navy, safety has normally been included as part of everything we do, and I think one of my concerns, before I got into this job, was that we were suffering from exactly what you described in that we would be the first to cut and that the rumors about lip service were somewhat true.

I find that the opposite is true, especially now that we have the focal point in the Secretariat, and that is, I work very closely with the Chief of Naval Operations organization. When they have problems, they are liable to let me know about it, and quite frankly, I think it has made a difference. An example is with respect to flight recorders.

Sometime ago, there was no thought at all of retrofitting flight recorders. It was going to be too hard to do and too expensive, and, indeed, that was true at the time. New developments brought this advanced technology to our attention and made it possible for us to demonstrate that it could be done, that it could be done relatively inexpensively and very, very quickly. In fact, installation of this on an F–18 took about a day-and-a-half for a couple of people who had never done it before.

That kind of knowledge and that kind of awareness was made available to the CNO organization, and they developed a special assessment team which then went out and studied what was available and went through all the proper chains that they had to go through and basically proved beyond any question that it was possible that it would be far more cost-effective than was ever thought before. As a result, on the 2d of May of this year, the Chief of Naval Operations decided to retrofit all F–18's and, in fact, also add this to the AV–8B's—not this technology per se but one technology like this. There are a couple of sources, at least.

Mr. WELDON. Good. Mr. Spratt.

Mr. SPRATT. Thank you, Mr. Chairman.

Thank you all for a very interesting presentation, gizmos, gadgets, and anecdotes all. It was a good presentation. Having offered a couple of amendments to make it easier to buy and for contractors to sell NDI's back in the 1980's, I am glad to see that some of this has borne fruit.

I have a particular interest, and I will admit it is sort of a parochial interest. It is a material called PBI. It is a good test case as to how well the safety consciousness in procurement is working. PBI is the material that is an alternative to Nomex. Produced later than Nomex, it is more flame-retardant and fire-resistant. It sus-

tains higher temperatures for longer periods of time than Nomex. It also costs about, I would say, 60 or 75 percent more than Nomex as well. It is a better material. I do not think anybody would contest that.

There is a fabric made of both Nomex and PBI—I think it is about 80 percent PBI and 20 percent Nomex—which is a very, very effective flame retardant and fire resistant material. It is being used by your flight-line fire fighters today. Hoechst-Celanese, the manufacturer of it, made in my district, has always been on the margin with this material because there is not a huge market, and when there is a much cheaper flame-retardant material available, they are always competing with the cheaper alternative. They have kept the line open for years because they believe the need is there, but it is just barely profitable with them, I believe. So it is always a question as to whether or not they will keep it open, and if they can sell it to the Air Force or sell it to the Navy, that is a huge entre for selling it for other product lines but also to other countries.

They have had a very difficult time, for example, selling it to the Air Force to be used in flight uniforms. General Paul, do you know the status of the Air Force's assessment of PBI-Nomex fabric to be used in flight suits?

General PAUL. No, sir, I am afraid I do not. I would be glad to respond on the record.

[The information follows:]

FIRE FIGHTING RDT&E FUNDING

Answer. The Air Force decided not to purchase flight suits made of a PBI-Nomex fabric because of the added expense of putting even a small amount of PBI in the fabric. The Air Force is now procuring flight suits using third-generation 3–A Nomex with improved properties and performance. Preliminary tests of this new material indicate it is equivalent in performance in the PBI-Nomex fabric, but less expensive.

Mr. SPRATT. I would appreciate it. I am told that there was some interest in it, but the price differential was significant, yet it does not work out to more than a matter of, you know, $30 or $40 per flight suit at most, maybe less than that based on the difference in the cost of the fabric. The people with Hoechst-Celanese with whom I spoke said that the material is more comfortable than the Nomex and it breathes better. It is certainly more flame resistant.

There was partly a problem with it, which was not of their making. They said a general officer got hold of the design of it and wanted to take this occasion to redesign the flight suit to look more like Captain Marvel, and he got it a little too tight in places like the crotch or something like that, and people said it was not a comfortable uniform. It did not have anything to do with Hoechst-Celanese, or at least they claim.

But this has been something always on the cusp that the Air Force has never quite found the necessary impetus to go ahead and buy this in earnest, even though it is clearly—if you are interested in safety in terms of being fire resistant and fire retardant—it is clearly the best material that you can procure.

If you could give me a report on that, I would appreciate it.

General PAUL. OK.

Mr. SPRATT. I am also told that they have been pushing the sale of some of the material that was made for Desert Storm/Desert Shield, which is a laminated material. It has the PBI on the outside and inside, and activated carbon beads on the inside. So it acts as a fire-resistant, flame-retardant material inside and out, but in between it has these carbon beads which are chemically active, and they combine with whatever chemical may be sprayed upon someone who happens to be wearing the uniform. These were produced on a rush basis during the Persian Gulf war for some pilots and for flight line personnel. They now have some of this material which they are trying to sell to the Navy Seals, mainly to be used for jumpsuits because they would be protective against flame and against chemicals as well. And they are willing to sell it at cost because it is extra material and they have got it stored in vacuum packs to keep the activated carbon working. But they do have a procurement problem there, and the procurement problem is that it is sole source. It has to be; this is a unique material. They were the prime contractor and the sole contractor for the manufacture of the material during the Persian Gulf war. They do not make the activated carbon interior. That is a German product, I believe, or a foreign product, at any rate.

But they have run into snags with the contracting officers, even though the Navy Seals apparently want it and it is designed for mission and suitable for it. If you could give me a report on that, I would appreciate it. I think it is parochial. I would readily admit it. But I also think that this is a good case of a material being available, commercially available, which is not being at least zealously purchased by the services. It is being used in a couple of cases, I might note. I mentioned the firefighters, and I think there are some flight line suits and maybe some pilot suits that are using it as well as the chemical weapons suit.

Yes, sir?

Mr. HEALING. Mr. Spratt, if I might say, the PBI-Nomex mix is what covers the firefighter's ensemble that the Navy has.

Mr. SPRATT. That is what that is.

Mr. HEALING. It is 80 percent PBI, 20 percent Nomex, where the Nomex provides the support for the PBI.

Mr. SPRATT. If you would revise your briefing to give us credit, I would appreciate that. [Laughter.]

Mr. WELDON. I might mention that was done at the suggestion of Congressman Spratt. [Laughter.]

Mr. SPRATT. As a matter of fact, during the Persian Gulf war, I was going to go over on the floor and put on one of these jumpsuits to advertise the PBI and prod the Air Force into buying it, procuring it more quickly. The Parliamentarian would not let me put it on in the well of the House, however. [Laughter.]

And I have to admit that he spared me some acute embarrassment, because as it turned out, it was a size 42 and it would not fit. [Laughter.]

Thank you very much, Mr. Chairman.

Mr. WELDON. Thank you.

The gentleman from Texas, Mr. Geren.

Mr. GEREN. If you had put a bag over your head, you could have pulled it out. They would not have known. [Laughter.]

This really has been an interesting hearing, and one of the issues that underlies all this is something that we talked about a little in our full committee yesterday, and I also attended a Small Business hearing yesterday as well. How do we make the military user friendly for the outside world for the small businesses, make sure that it is open to all the innovations that we see going on in the private sector and make sure there is not any sort of unacceptable lag time from the time we do have some important development on the outside before it works its way into the services?

When it comes to fire safety or some of the type of safety devices or safety practices which have similar applications or uses or needs in the civilian world, do you all undertake on any regular basis a review of what is going on in the civilian world and compare what you have to what they have?

What makes me think of that, I know in just traveling around some with Chairman Weldon on some Fire Caucus visits to fire departments, the level of the quality and the technology that some fire departments have is very different than what other fire departments have, in emergency gear—it is just amazing what sort of technological advances are out there, and some fire departments have them and some do not. Sometimes it is just a question of cost. Often it is big-city versus little-city or whatever.

As you all develop your requirements, what type of a review do you have to make sure that you are staying on top of things technologically, stay innovative, and make sure that you do not get insulated from what is going on out there in some of these areas?

General PAUL. One of the things that we do—and I am sure some of the other services do, too, which I think is a great mechanism to interchange what we are doing with what the civilian fire departments are doing—is very actively attend the various fire protection societies and associations. Sometimes there are trade shows and so forth associated with that, but the National Fire Protection Association and the International Association of Fire Fighters, for example, we go to their meetings. We participate on their panels. There is a very active interchange, and that happens on a continuing basis. And those are attended by the people who use the equipment, so it is the firefighters themselves. We have found that is a very productive way to try to have a two-way flow of information.

Mr. GEREN. Is that common in the other services?

Mr. HEALING. For the Navy, I can certainly say we do that. We have a number of people that vigorously seek out and attend various meetings. We also belong to NFPA; various parts of the Navy organization belong to that.

My office is specifically focused on covering those commercial sources, so we advertise about quarterly in the Commerce Business Daily and cite certain examples such as the pump replacement and the SCBA's that we are starting to use, letting the outside world know that, hey, we are buying these things and we are going to put them into assessments in the fleet. And if they turn out to be better than what we have got, we are going to push to implement them on a broader scale.

That is probably the best way that I can think of to get the word out to people that want to do business with the Government. Now, the other side of the coin is that the Government is definitely get-

ting more friendly as time goes on. I think the acquisition reform efforts are really having an effect right now, and that is to say that people who formerly had no desire at all to do business with the Government are finding that it is a little bit easier to approach us. My office in particular has an open-door policy, which makes it very easy for them to enter.

Ms. JONES. Certainly in the acquisition reform effort that is centered at OSD, there are a number of initiatives, for example, more use of electronic commerce to announce what we are looking for and particularly to allow small business with very little overhead to be able to find out that DOD needs something and respond, I think is making it easier for firms, particularly small firms, to do business with DOD, firms that do not know all the Federal acquisition regulations, have not had a history and, therefore, the contacts or the knowledge base of who to contact about what. I think there are some improvements.

Mr. GEREN. I do not know how you would compare yourself to the private sector, but, again, in going around and looking at different fire departments, what the city of Fort Worth has and what the city of Springtown has are night and day. I am sure what New York City has and what Ames, IA, has are different as well.

How do you all decide what level of preparedness is appropriate? It is largely budget driven, I would expect, in the private sector in the fire area, how influential the chief is or how good of a salesman the chief may or may not be. But how would you compare, say, the fire protection you offer on your military aircraft to the comparable civilian aircraft, the 707, what the FAA requirements are compared to the military requirements for the same type of aircraft? Do you all have any way of comparing what level of preparedness that you require of yourselves to what kind of safety that we ask of anybody in the commercial sector when they are dealing with the general public?

Mr. HICKS. Let me try that. Fire fighting and fire protection in the Army is centralized as a commodity under the Assistant Chief of Staff for Installation Management, which is a relatively new organization for us. It is at the Headquarters DA level, and it is to coordinate and integrate a variety of issues and requirements across all Army installations, and firefighting and other facilities engineering issues are integrated under that office.

If you were to visit Fort Rucker, AL, and look at Cairns Army Airfield, you would see the same equivalent level of firefighting—equipment and facilities and trained firefighters—as you would at a civilian airfield with the same sort of threat. The Assistant Chief of Staff for Installation Management has a hierarchical structure, a guide for what level of fire protection should be applied to different installations, and it varies by that threat. So it is essentially managed at that Headquarters DA level. It focuses on the particular threat at an installation, and it appears to me, by and large, it is equivalent to, that framework is equivalent to the same sort of thing that would apply in the civilian sector in a town or airfield.

General PAUL. I would just add with respect to Boeing 707's or commercial aircraft, we use the same standards as the Federal Aviation Agency, so to the degree that the standards define some level of performance, we know we have that equivalency.

Mr. GEREN. All right. Well, thank you very much.

Thank you, Mr. Chairman.

Mr. WELDON. Thank you, Mr. Geren.

Dr. Jones, the President has issued an Executive order dealing with counterterrorism. What are we doing in the technology area in that regard? I want to focus, if I can, for a while on what are we doing, not just to provide the best technology for our troops, which is our top priority, obviously, but what are we doing with all these neat gimmicks and gadgets and technology to make that available and to interface with the private sector, with the municipal departments? You know, when we develop a thermal imager, how do we convey that and say that it is available and you ought to look at the capabilities of that little device that somebody held up that looks like a flashlight? How are we communicating that out to the—are we doing it in a regular way, and is there a formal process to do that? But focus first of all on the terrorism issue. What are we doing there in the R&D area?

Ms. JONES. Well, let's see. There is certainly a wide variety of technology efforts that you could count as contributing to counterterrorism, all the way from the chemical-biological program, detection of chemical and biological agents, defense against them, protective suits for individuals to wear whether they are in a combatant situation or not.

In terms of coordination and making technology available, the President in that directive that you mentioned has created an interagency coordination board, both at the executive level and at a working level. This is a very active group, as I understand it, and Defense is a participant and a supporter of what the country is doing nationally. So I believe that is a forum by which such issues can get discussed.

A second answer to your question is that in the technology program it is routine behavior for the scientists and the engineers to participate in workshops and conferences. Some of them are military unique, but a lot of them are also just a mixture of military and civilian. That is part of the mechanism that we use to learn about technologies that might be important for the war fighters and for the support personnel, but it is also a way for us to communicate to the larger community what we are doing and how we are doing it.

Mr. WELDON. I guess that gets to the heart of my question. Is there a process in place that elicits direct inquiries from the civilian sector regarding technologies that you are all developing that we can share with them in the area of whether it is terrorism or whether it is urban search and rescue? Is there an interface there that is in place, or is it just done informally on an ad hoc basis or when there is a disaster like we saw with the Oklahoma City bombing?

Ms. JONES. I think the answer is yes, yes, and yes. There are some formally defined cooperations, and I alluded to the one with law enforcement that we established this last year that built on some prior cooperative work between the FBI, for example, and ourselves.

Mr. WELDON. And that was in the law enforcement——

Ms. JONES. That was with the law enforcement community, and I think you will find that for some specific areas there are formal relationships certainly between the agencies but also broader nationally. But it will be on a specific area, not DOD-wide global for technologies. Law enforcement was a good example of that.

The second, the mechanism I mentioned where there is interchange at the technical workshops and conferences and application workshops, that is not structured and organized and driven top-down. That is, again, part of the way the technology community goes about its business of information exchange. And so you could, I guess, describe it as ad hoc, but it is standard operation procedure, and it is a smart way to operate, because you want to know what is happening outside. You want to air what you are doing to other experts so that they can critique what you are doing because that makes you smarter, allows you to avoid some mistakes some people might have already made or spotted.

General PAUL. I would also add we have made every effort to try to make it simpler to penetrate the bureaucracy, so to speak, because it is hard to know where you go for a technology. How do you ask the right person or who do you call? Within the last 2 years, we have set up a hotline, which we call Tech Connect, and the whole purpose of that is to facilitate somebody from the private sector being able to call the Air Force and say I have got a question and I do not know who to ask. We staff that with four or five people——

Mr. WELDON. On an emergency basis, 24 hours? Is that what the hotline is?

General PAUL. It is 5 working days a week with answering machines so we can get back to them. It is not designed for emergencies. It is designed so if somebody had an inquiry and said I have got a problem, do you all have a technology that might be able to help us.

We have operated that for 2 years, and the number of inquiries have been in the thousands. And what we do is research the answer and then provide a focal point so they do not have to make 10 phone calls and be discouraged. We network data bases with the other services, with the other agencies as well, and we are averaging a few hundred calls a month now. We send out a survey for feedback, and it has been very well received. So that helps gain access if somebody does have a question. We advertise this in trade magazines, put the phone number out, and it is just an attempt to be more proactive in letting people access us.

Mr. HICKS. I could also add, you were asking about is there any formality to the process. In addition to the items that the other individuals have mentioned, for every new development or every acquisition of a system, the program manager is required to do what is called a market survey, and he must come to the milestone decision authority armed with the results of that survey, which the decision is essentially spring-loaded toward—if we are going to buy some item or acquire some item, the first answer is getting it from another service or from another Federal agency or from the commercial side. And the proof is on the program manager to prove that, in fact, those sources are inadequate for whatever reason. That is part of our requirements generation process that starts at

the various schools and centers within the training doctrine command and flows up through the acquisition process, and the decision authority for that system and for that acquisition is the one that makes the decision, which is not the program manager. So there is some objectivity and formality to the process.

Mr. WELDON. One of the frustrations I had—and maybe I had the wrong perception. But in looking at the whole issue of—and, Dick, Dick Healing, you raised this earlier—the issue of the OBA, which the Navy has used for 40 years, which has not been used by a municipal response group for the last 20 years and is a self-contained, self-starting, manually operated breathing apparatus, with leather lungs, as you probably all know.

In looking at that and the replacement, it appeared to me as though each of the services was doing its own R&D and that NASA was doing its own R&D, and maybe I had the wrong impression. That is going back a couple of years, that nobody was talking to each other. Was that the case?

When I got on this thing, I guess it was 3 or 4 years ago initially, the Navy had a need and they were going to work on this new type operation. NASA had already developed a 2-hour breathing apparatus that they used to get the astronauts out in case of an incident, and the Air Force was developing its own.

My logical question is: If all the services have the same need, realizing if you are in the Navy you have got a confinement problem because you have got to go up and down ships, therefore if the configuration of the unit is different perhaps—but it is not different from NASA because they have to have the same concern. But a breathing apparatus is a breathing apparatus is a breathing apparatus; you know, positive pressure, those kinds of things you want wherever you are.

Was that a misconception? Was there a lack of coordination? And maybe it has changed, or maybe I just misread it. Dick.

Mr. HEALING. Sir, you had somewhat a correct perception, but I would not say totally correct in the sense that I think the Navy always knew that the Air Force was doing what it was doing to develop the SCBA that they are working with. I think what we had to deal with within the Navy was a very strong perception that a small scuttle could only be entered if you had a chest-mounted, close-hugging device like the OBA. Quite frankly, the OBA never resulted in a serious injury or a fatality that we know of. And so with that as a comfort factor and the fact that it was designed specifically for that use, we kind of stuck to our earlier design principles, and it is only recently that we have been—again, with your support—able to break through and provide for the sailors to try this other device. We gave it to them and said, here, try it: Is it as good? Is it better? And they developed ways on their own of finding ways to use it going through the scuttles, and they found that it was a much easier device to use in the long run.

We had an additional factor that came in when we shifted to the firefighter's ensemble over there, which is considerably thicker and more cumbersome than what they used to wear, which was dungarees and chambray shirts. The fire fighter's ensemble tended to squeeze the lungs down on the OBA, and that made it a different kind of problem to deal with. One improvement created a problem

in another area, making the SCBA far more feasible and compatible, and that is really why we are pushing forward vigorously on the program.

Mr. WELDON. It is going to be very expensive, I imagine, to reconfigure the whole Navy. What do you have, about 40,000 units in operation in the Navy?

Mr. HEALING. Yes, sir. I do not know the exact number, but I can say that it is a large number, and reconfiguring is a cultural change to a small degree. But based on the sailors, the users' comments and the users' desires right now, I think it is the direction we have to look.

Mr. WELDON. I agree.

Mr. HEALING. Because the cost of putting compressors on is going to be a challenge, and the weight and ballast considerations and so forth are going to have to be addressed. That is what we are going to find out this year.

I think everybody involved in the program is very excited about it.

Mr. WELDON. Good.

Dr. Jones, I mentioned earlier the International Association of Fire Chiefs had raised the issue with me of the need for metropolitan areas to obtain chemical-biological detection kits if they are, in fact, available, if the military has them, and entry suits for hazmat teams. They particularly raised the issue relative to the sarin gas that was used in Japan and the fact that they do not have the technology now except to go beyond a 5-minute time period, which is certainly not going to be able to handle, say, a subway if you have an explosion involving sarin gas.

I do not expect you to answer this today, but for the record, can you tell us what kinds of assistance from a technology standpoint we can provide to our municipal units around the country and to this international association, maybe to advise them on steps they could take or technologies that maybe the military has been working on in this area?

Ms. JONES. Let us say we would be glad to take that for the record, look at what we have that might be of interest and get that back to you.

[The information follows:]

CHEMICAL AND BIOLOGICAL DEFENSE EQUIPMENT

The primary mission of the chemical biological defense program is to ensure that U.S. forces are prepared to fight effectively in a nuclear, biological and chemical weapons environment. In carrying out this mission the Department has developed particular expertise in protecting personnel (and facilities) from chemical and biological (CB) agents and terrorist acts of violence. Many aspects of the required training and technological advancement may be leveraged by civilian police, fire and health officials to enhance domestic preparedness. DoD Research and Development programs have been instrumental in expanding sampling, analysis, detection, identification, and mitigation technologies to defend against weapons of mass destruction.

Technologies under development include: a CB perimeter monitoring system; man-portable CB backpack foamer; mobile environmental analytical platform; ultrasonic non-intrusive detector; and blast suppression mitigation devices. The first generation (chemical only) of the CB perimeter monitoring system was deployed in Iraq to support the United Nations Treaty Inspections. Many components of currently developed technologies are planned for future/continued deployment in support of domestic events of national interest.

Additionally, CB protective clothing has been developed to meet the diverse operational needs of each service. This clothing is currently available in undergarments,

overgarments, duty uniforms, and aviation overgarments. The garments provide the highest level of protection against CB threats while reducing heat strain, weight, and bulk to an absolute minimum.

To assist in advancing CB defense and counter terrorism skills for civilian police and rescue personnel and other federal agencies, the U.S. Army Chemical School offers a four day training course in Chemical Biological Counterterrorism. Personnel from the New York and New Jersey Port Authority, the City of New York police and fire departments, Defense Protective Services and the Federal Emergency Management Agency have participated.

Mr. WELDON. Fine. Also, I do not expect you would know this right here today, but for the record, in talking to the big-city mayors, a major concern they have right now is responding to not just urban terrorism but urban incidents where you have significant numbers of people that are trapped. If you could go through the R&D activities of the military, are there technologies, are there practices and processes that the military has that they are using that could benefit the civilian sector in terms of rescuing people, in terms of cutting through structural steel like we saw in the Oklahoma City situation, stabilizing that building while the first responders were able to get those victims out?

There is a major need right now for our cities who are very concerned, especially following the World Trade Center and Oklahoma City and a couple of subway incidents, that they do not have the technology, that they do not have the cutting tools, they do not have the processes in place. And FEMA has responded. They set up urban search and rescue teams within the last 5 years, partly because of the need to have experts available to come on an instant basis. That worked very well in Oklahoma, but that is just the personnel. What I am saying is, do we have any technology that we can use? If you would make that available for the record, I would like to do a follow-up with that, as I said before, working with some of the big cities in the country on that issue.

[The information follows:]

RESCUE AND HARDENING TECHNOLOGY

The Services have developed many technologies useful in urban rescue operations, particularly where structure stabilization and cutting tool technology is needed to free trapped personnel. While these technologies were developed to support military operational requirements, all have potential for civilian use. In fact, one of the cutting tool technologies, the K–12 carbon blade rescue saw was used extensively by municipal rescue officials during the Oklahoma bombing rescue operations. This saw is non-sparking and was originally developed for cutting into aircraft where fuel vapors are present. It has great potential in rapid rescue scenarios, and is capable of cutting through concrete reinforcement and similar metals.

In addition, service technologies have been developed and demonstrated during military exercises which support post attack recovery and protection from terrorist bombings. Hardening and damaged structure stabilization technologies include use of materials and equipment to support placement of light rapid setting concrete, splints constructed of steel plates and long bolts, and mechanical jack systems to shore and strengthen damaged building columns, flooring, ceilings, and horizontal beams.

Other DoD technologies developed for use in rapid rescue and structure stabilization include structural water/air drills, and a handheld high speed cutting device which will rapidly cut electrical cables and light metal members typically associated with collapsed building rescue.

Ms. JONES. We will certainly take that for the record. I think General Paul gave you some examples that would appear on that list.

Mr. WELDON. Yes, that is right.

Training is done in each of the services separately, and there is no coordination. Where is your emergency response for anything being done now, General Paul? It used to be at Chanute. Since you closed Chanute, where do you do it?

General PAUL. Goodfellow Air Force Base.

Mr. WELDON. Is that for all the services? Are they all doing it there?

General PAUL. Yes.

Mr. WELDON. That is great. Do you invite the other Federal agencies that come in? Because at one point in time each of the services had its own center, and Interior had its own operation, State had its operation. There was just not a coordination among the Federal agencies. Is that being done? And I guess this gets to a broader issue of if you look beyond DOD, the whole Federal Government, I seem to sense a lack of coordination beyond DOD within Interior, with State, with all the various agencies that operate facilities; and yet from the standpoint of land-based facilities, the risk is the same, the hazards are the same.

It would seem that if DOD is taking the lead, all the agencies should be coordinated with DOD. Why should the Department of State have to have a separate facility to train its people when DOD already has those facilities?

There used to be a coordinating group that met like once a year, an informal group, but is there a coordination beyond DOD from a training standpoint, beyond the services? Is there training-wise? Anyone know? You do not know?

Mr. HICKS. That is probably an issue for the Secretary of Defense office I mentioned, the Environmental Security and Occupational Health and Safety. I know that coordination of training for hazardous material response is an item of consideration at that level. Within the Army, we, in fact, do some of that training from our safety center, and then use the resources of other Federal agencies such as the Occupational Safety and Health Administration. If it was coordinated, it would be at that Environmental Security——

Mr. WELDON. You see, my fear is it is not being coordinated, and let me give you a comparison. In the law enforcement area, all the Federal agencies for the most part use the FBI Training Academy, as well as local law enforcement agencies sending their people there. There is nothing, to my knowledge, like that in your area, yet we are spending, I think, far more money in the ongoing training of emergency responders where there is not a coordination. And I am looking at a way to try to save some dollars as well as provide—I mean, handling a situation, an emergency situation is the same, whether you are in a structural building, at an Air Force base, an Army base, a Navy base, unless, obviously, if you are at sea. That is different. But the Navy has had a practice, especially using your new computerized training simulators, where you bring in the local people around the area and use that. But I am talking about the more generic emergency response training.

There is no reason that I can see that we train people from the Department of the Interior, even though it may be different in fighting a wild lands fire or a response of that type, but the training is basically the same. I think DOD just by its sheer size would be the agency that probably should take a lead on that, and per-

haps there are ways that we could save Federal dollars by having all of training focused, much like we have the FBI Academy do all that training for the law enforcement community in the country.

If you have any thoughts on that, I would appreciate that. You know, the goal here is to try to look for ways not just to help you raise your visibility in protecting our troops in the field and in their bases in this country and around the world, but to try to find ways to see if there are some economies of scale, some savings, and some coordination, not just within DOD but within the entire Federal Government. My feeling is DOD should set the tone and should lead the way, and not just for the military but, if possible, when we have extra space, why not let municipal departments and municipal agencies pay a price and send their people like your local communities do with the FBI Academy.

That is where I think we should be going and using the leadership role that all of you have established.

[The information follows:]

FIRE AND EMERGENCY RESPONSE TRAINING

DoD provides military personnel entry level and advanced fire fighter training at the Joint Service Fire Protection Training School located at Goodfellow Air Force Base, Texas. Training is focused on first responder and basic fire fighter techniques common within all service components and is utilized by approximately 3,000 military personnel each year. Service unique training, such as the Navy's shipboard fire fighting, is provided by individual service and further enhances DoD personnel safety and rescue capabilities.

The DoD has a continuing history of cross training and operational support with civilian fire fighters and rescue personnel. Service base commanders and civilian community fire chiefs actively work to insure adequate rescue and fire fighting capabilities for base operations and the surrounding community. This is especially important in remote base settings. To ensure quality of performance and readiness, DoD conducts an accredited Fire Fighter Certification Program. This program is supported by personal computer based Distant Learning Training which enables the firefighter to reach a performance level through home station training. There are currently more than 8,000 fire fighters enrolled through this process.

Although use of a centralized DoD training facility may be more cost effective than individual federal training facilities, at present there are not enough available training slots for meeting the service needs in this area. To meet the needs of municipal departments would require an expansion of DoD training facilities, staff, and funding to accommodate personnel other than DoD.

Ms. JONES. We will take that for the record and tell you what the status of that coordination is, and we can go from there.

[No response.]

Mr. WELDON. I want to thank you all for coming in, and take back the message to your superiors that we are going to keep this issue very visible, which will enhance your positions, and it is very important to tell you this during a time of no major disasters because we will be there to ask the questions when those incidents occur—and they will occur. We all know that. That is a fact of life. And I want to make sure that all of the services understand that the personal protection and safety of our troops is our highest priority.

As I said earlier, we get hit all the time for more money for bombers and fighters and ships and tanks and bullets and all that, but I have never had someone call and say, hey, would you give me some more money for safety or for protection for the troops. And Joe Taussig, this hearing probably should be held in honor of Joe for all the work he did, and all those out there who are fight-

ing, many in the audience who do this regularly. I see Ron Fisher from Defense Fire Protection out there, and other national groups. So there are people doing this work across the board in protecting our troops, and we appreciate that.

Dr. Jones, your testimony was very on the mark. We appreciate your willingness to work with us, and to each of you, we appreciate your cooperation and your leadership within your individual services.

Thank you. The hearing stands adjourned.

[Whereupon, at 3:55 p.m., the subcommittee was adjourned.]

Counter Terrorism

Mr. Weldon. What is the DoD technology role in participation in the interagency effort to counter terrorist activities? Please describe the programs and associated budgets that will support this directive and identify which are new FYDP programs or changes in dollar commitments as a result of the directive?

Dr. Jones. DoD contributes technology to our fight against terrorism through participation in the Technical Support Working Group (TSWG). The TSWG is the R&D arm of the National Security Council's Interagency Working Group on Counterterrorism (IWG/CT). DoD cochairs the TSWG with the Department of Energy with oversight provided by the Department of State. The DoD contribution to the R&D budget of the TSWG is about $8 million in FY 1995, and we are requesting about $12 million for FY 1996.

The five Department Secretaries, the Attorney General, and two Directors are required to submit a readiness report coordinated by the Assistant to the President for National Security Affairs by December 21, 1995. The report is to include an analysis by the IWG/CT on counterterrorism as well as a detailed discussion of the TSWG and the counterterrorism R&D program.

Vulnerability of DOD Facilities

Mr. Weldon. What are DoD's plans for complying with the requirement of the Justice Department Report on "Vulnerability of Federal Facilities", published as a result of the Oklahoma federal building bombing?

Dr. Jones. As you know, DoD operates many different types of facilities, and the actions that are appropriate must be assessed for each facility separately. The Assistant Secretary of Defense for Command, Control, Communications and Intelligence has asked the Military Departments, the Defense Agencies and the various offices reporting to the Secretary of Defense to review the Justice Department report to determine whether our facilities meet the minimum standards. His Memorandum further directs that immediate steps be taken to upgrade facilities found to be deficient. The recommended standards do not directly depend on advanced technology although some programs now ongoing, such as the uncooled infrared detector, can contribute to future security.

Safety and Survivability Requirements

Mr. Weldon. How does DoD and how do the military services identify operational and potential combat personnel safety and survivability requirements?

How do you prioritize these requirements?

Dr. Jones. Each of the services utilize different mechanisms to define their overall requirements, including those which apply to personnel safety and survivability. Among the important methods used is the analysis of each mishap by the respective safety organizations to specifically identify safety issues and trends. Trends analysis of material deficiency reports also aid in the identification of safety issues before they result in a major mishap. In addition, each exercise and operation undertaken by the services both jointly and individually produce lessons learned which are often a source of requirements. Each Service prioritizes safety and survivability requirements within their respective prioritization processes.

Mr. Weldon. How does DOD and how do the military services identify operational and potential combat personnel safety and survivability requirements?

Dr. Jones. Requirements for Army systems are developed and priorities are established within the materiel development and combat development processes. These processes are formalized in Army Regulation 70–3 and Department of the Army Pamphlet 70–3. Integration of safety requirements as part of the overall mis-

sion needs is the key aspect which allows combat effectiveness and safety to be maximized within program constraints. This ensures safety is not seen as a separate activity, but considered inherently in day-to-day activities of the development and use of the system. As a part of this process, the Army combat developer is specifically responsible for identifying system safety requirements and addressing the expected costs of accidents within cost and operational effectiveness analyses for new materiel acquisitions.

Mr. WELDON. How do you prioritize these requirements?

Dr. JONES. There is not a separate process for prioritizing Army personnel safety and survivability requirements. They are prioritized in the systems improvement process which considers personnel safety and survivability along with combat and mission improvements. This process ensures the optimum degree of safety within the constraints of mission effectiveness and available resources. The prioritization is prepared jointly by the materiel developer and combat developer, usually the Army branch proponent, and approved at the Headquarters, Department of the Army level, for funding consideration. Only those requirements above the funding level are approved for implementation; those below remain unfunded.

Mr. WELDON. How does DoD and how do the military services identify operational and potential combat personnel safety and survivability requirements?

How do you prioritize these requirements?

Mr. HEALING. Requirements for Navy and Marine Corps are identified by the fleet and field forces, based on actual operational experience and on analysis of information from other sources, such as intelligence. The requirements are thoroughly reviewed by appropriate functional levels that validate and refine them, before determining resource allocation or research and development efforts that may be necessary. Communication with other services is maintained to ensure that common (joint) requirements are handled by a single "lead" service, with cooperation by the others as appropriate. The Chief of Naval Operations and Commandant of the Marine Corps finalize the requirements and allocate available resources to meet them on a priority basis. Priorities are established within functional areas by CNO/CMC resource sponsors, subject to fleet and field force inputs. Within the Navy Department, the Safety and Survivability office acts as an advocate for safety and survivability issues identified by the fleet and field forces, and attempts to ensure full and appropriate consideration in the process of prioritizing and resourcing.

With respect to prioritization, the S&S office closely monitors individual incidents, long and short term trends, and information from all other sources to establish basis for focusing remedial efforts and developments to meet future needs. In conjunction with the respective CNO/CMC functional area sponsors, S&S ensures that SECNAV inputs are included in the process, and that SECNAV priority issues are properly resourced.

USE OF COMMERCIALLY AVAILABLE EQUIPMENT

Mr. WELDON. We get various reports that the Services do not take sufficient advantage of off-the-shelf, commercially available equipment or do not look to the other services or executive departments first for solutions for their requirements. The statements prepared for the record indicate significant use of off-the-shelf, commercially available equipment. The question is, is there a formal process that requires the Service Departments to consider already developed equipment and are we taking as much advantage of commercially available equipment as we could?

Dr. JONES. The Department of Defense has long encouraged the use of nondevelopmental and commercial items when these items are suitable replacements. The Department of Defense Instruction 5000.2, entitled "Defense Acquisition Management Policies and Procedures", requires that material requirements be satisfied to the maximum extent practicable through the use of nondevelopmental items when such products will meet the user's needs and are cost effective over the entire lifecycle. This instruction details the process for defining requirements, evaluating candidates, and determining logistics support. Each of the Services have individual procedures to implement this guidance.

Mr. WELDON. We get various reports that the Services do not take sufficient advantage of off-the-shelf, commercially available equipment or do not look to other services or executive departments first for solutions for their requirements. The statements prepared for the record indicate significant use of off-the-shelf, commercially available equipment. The question is, is there a formal process that requires the Service Departments to consider already developed equipment and are we taking as much advantage of commercially available equipment as we could?

Mr. HEALING. For the Navy Department, there are numerous levels at which emphasis is placed on procurement of NDI/COTS equipment. In addition to the S&S

NDI program outlined in my statement, there is a focused effort within the Office of the Assistant Secretary (Research, Development and Acquisition) aimed at streamlining the acquisition process and taking advantage of NDI/COTS equipment—working closely with the similar DoD effort. Specific elements of the changed acquisition process are falling into place very quickly, and broader use of commercially available equipment and commercial standards is rapidly gaining acceptance. While we still have a long way to go, both the acceleration and momentum toward full, appropriate use of NDI/COTS are encouraging. One factor that will continue stretching the goal is the extremely rapid development of new technologies that takes place in the profit-driven commercial sector. Finding the balance that takes optimum advantage of the rapid growth in available NDI/COTS equipment, motivated by profit and driven by competition, and our need to maintain clear military advantage and near perfect reliability in an operational system paid for with public funds remains a large part of the challenge.

Mr. WELDON. We get various reports that the services do not take sufficient advantage of off the shelf, commercially available equipment or do not look to the other services or executive departments first for solutions for their requirements. The statements prepared for the record indicate significant use of off the shelf, commercially available equipment. The question is, is there a formal process that requires the service departments to consider already developed equipment and are we taking as much advantage of commercially available equipment as we could?

Dr. JONES. The Army has a formal process. The Army policy requiring consideration of off the shelf equipment (or, acquisition as a Nondevelopmental Item (NDI)) is provided in Army Regulation (AR) 70–1. AR 70–1 provides implementing policy and standardized procedures in accordance with Department of Defense Directive 5000.1. This directive requires the use of existing US or allied military or commercial systems to be assessed and formally reviewed as an approach to satisfying any materiel need or requirement. To complement those procedures specifically in the safety area, the Army has developed and published standardized guidance to program managers for the conduct of system safety during NDI acquisitions. These procedures were published as Department of the Army System Safety Coordinating Panel Technical Report 87–1A.

TECHNOLOGY TRANSFER

Mr. WELDON. Since the bombing of the federal building in Oklahoma City and the sarin gas attacks in Tokyo subways, city fire chiefs and police departments have become more interested in what equipment might be available to protect their people in responding to potential terrorist incidents. What formal mechanisms exist, such as outreach programs, to make DoD developed equipment available to civilian communities?

Dr. JONES. A number of formal mechanisms exist through which DoD technology, equipment, and systems are transitioned to the civilian community. As an example, in April, 1994, DoD signed a Memorandum of Understanding (MOU) with the Department of Justice which provides for the evaluation and transfer of existing and developmental DoD technology and equipment to law enforcement agencies. This includes public safety agencies that would be the first responders to a crisis such as that cited in your question. The MOU established the Joint Program Steering Group (JPSG) which is composed of representatives from the Advanced Research Projects Agency (ARPA), the Army, the FBI, and the National Institute of Justice.

The JPSG is utilizing the Service laboratories to identify and transfer existing technology and equipment useful to the law enforcement community. In addition, the JPSG members are developing advanced technologies that are applicable to both law enforcement and military operations other than war (OOTW). These technologies will transition to both communities. Current developments include remote concealed weapons detection technology; geo-location devices; precise sniper detection and location; improved body armor; biomedical technology; and advanced decision aids for crisis management. All of these technologies will enhance the survivability of both the soldier and law enforcement officer.

Another avenue for transfer of DoD technology is the Technical Support Working Group (TSWG) which is the R&D arm of the National Security Council's Interagency Working Group on Counterterrorism (IWG/CT). The TSWG is chaired by DoD and is charged with addressing the technology and equipment needs of the military and law enforcement community in combating terrorism.

PERSONNEL SAFETY AND SURVIVABILITY

Mr. WELDON. Major acquisition program managers are under constant cost and performance pressures. What process exists within the Office of the Secretary of De-

fense to try and preclude safety and survivability from being sacrificed to new term cost and/or performance pressures, even when it can be demonstrated that near term short cuts increase life cycle acquisition cost? The Navy, for instance, has an analysis that indicates that incorporation of the flight data recorder in original F–18 would have paid for itself several times over in accidents prevented.

Dr. JONES. All of the Services, as well as the Secretary of Defense, recognize that our soldiers, sailors, marines and airmen are our most valuable asset. Providing our people with as safe an operating environment as possible has been and will continue to be a high priority. However, the very nature of our business places our personnel at risk and reasonable risks must often be accepted to ensure mission effectiveness. Eliminating hazards and minimizing and controlling the residual safety risks are defined processes in Defense acquisition. The Department's policy, as defined in DoD Instruction 5000.2 "Defense Acquisition Management Policies and Procedures", is to eliminate or control all safety hazards prior to Milestone III Production Approval. The acceptance of "high" or "serious" safety risks that cannot be overcome is a formally documented process that is subject to review by the Office of the Secretary of Defense for major acquisition programs.

EXTERNAL INTERFACE WITH FIREFIGHTING ORGANIZATIONS

Mr. WELDON. Does your office interface with other fire, safety, and survivability organizations and offices such as: Federal Fire Service Task Group, DOD Fire and Emergency Services Coordinating Committee, OSD's Office of Occupational Health and Safety Policy, Fire Administration, and Center of Building and Fire Research.

Dr. JONES. My office maintains a close working relationship with the Office of Occupational Health and Safety Policy within the Office of the Deputy Under Secretary of Defense for Environmental Security. Members of the Service represent the Department at interagency and non-governmental organizations such as those mentioned above. In this capacity the services are able to exchange information concerning DoD firefighting requirements and share lessons learned both from research and development as well as from the operational aspects of firefighting, safety and survivability. In addition, Service personnel represent the Department as members of the National Fire Protection Association.

ARMY FOCAL POINTS FOR SAFETY AND SURVIVABILITY

Mr. WELDON. While the hearing testimony indicated that the Army and Air Force have focal points for safety and survivability in their respective secretariats similar to the Navy, these focal points were unknown to the services legislative affairs offices when the hearing was being arranged. Please identify these focal points by name and position for the record.

Dr. JONES. The Deputy Assistant Secretary of the Army (Environment, Safety and Occupational Health), Office of the Assistant Secretary of the Army (Installations, Logistics, and Environment) is the focal point for safety in the Office of the Secretary of the Army.

SAFETY FOR FIRE FIGHTING PERSONNEL

Mr. WELDON. In your opinion, is all of the equipment and clothing in use adequate to meet operational requirement and provide reasonably adequate levels of safety for fire fighting personnel? Where are the deficiencies? Are the corrective actions to these deficiencies adequately funded?

Dr. JONES. In our opinion, equipment and clothing for fire fighting personnel are adequate. The Army's only problem in this area is that some of our equipment (i.e., fire trucks) is old and nearing the end of its service life. Replacement funding has been programmed but actual funding is inadequate.

FIRE FIGHTING EQUIPMENT AND CLOTHING

Mr. WELDON. In your opinion, is all of the equipment and clothing in use adequate to meet operational requirements and provide reasonably adequate levels of safety for fire fighting personnel? Where are the deficiencies? Are the corrective actions to these deficiencies adequately funded?

Mr. HEALING. Along with our sister services, the Navy and Marine Corps face common fire fighting challenges ashore, which are being adequately met through use of commercially available technologies and equipment. This is an outstanding example of dual-use, with civilian standards developed under the NFPA driving safety achievements over the years, and the military services being able to take full advantage of their advances. In return, the military has developed several new tech-

nologies that can be put to use in the civil sector. Examples are special fire fighting tools developed under the Air Force for use in fighting aircraft fires; and the Navy's infra-red imager, Naval Fire Fighters Thermal Imager (NFTI), originally a British development, now widely used in shipboard firefighting.

Current research within the Navy, much of which is performed at the large scale test facility Ex-USS SHADWELL in Mobile, Alabama, takes direct aim at recognized areas for improvement. For firefighting personnel, there are improved NDI/COTS breathing apparatus, escape gear, emergency notification/communications equipment, and doctrinal modifications being tested, evaluated or developed. With the introduction of the Fire Fighters Ensemble (FFE), a heat stress problem was recognized, and several methods of controlling that problem have been put into effect; but additional work will continue to seek further improvements. Funding has been adequate, and focus on use of NDI/COTS solutions will provide the most economical way to continue dealing with new challenges in this area.

Firefighter Protective Equipment

Mr. Weldon. The Defense Technology Plan set the goal of developing by 2005, a firefighting protective ensemble capable of doubling the time a firefighter can safely be exposed to intense heat. Is this still a goal? If so, what is being done in the garment development area to ensure this goal is achieved?

Dr. Jones. Doubling the time a firefighter can be exposed to intense heat through the development of an advanced firefighting protective ensemble remains a goal of our firefighting Science and Technology program. To address this goal there is an ongoing development effort that is jointly funded by the Air Force and NASA. This effort is focused on developing a cryogenic unit that will provide breathing air for the firefighter as well as act as the cold source for body cooling. The cryogenic unit is coupled to an undergarment that incorporates coolant-filled tubes which provide direct cooling to the firefighter's body. While this effort is not complete, initial results indicate that the cryogenic unit and cooling undergarment will extend the range of temperatures that a firefighter can withstand from 2000 °F to 3000 °F and will provide a firefighter with two hours of breathing air.

New Firefighting Technologies

Mr. Weldon. How much funding by year (FY95 and prior, and FYDP period), program element and organization has been programmed to the following projects and what are the originally planned and current time frames in which these technologies will be available?

Halon 1301 to substitute as a total flooding agent? Halon 1202 in handheld extinguishers in aircraft? Halon 1202 in portable units on landing ships? Fine mist spray systems in engine rooms of ships? The cryogenically cooled firefighter ensembles? Polymer foaming agents? Laser based systems for detecting colorless flames?

Mr. Healing. NAVAIR has a substantial research and development effort on Halon 1301 alternatives for aircraft. The effort began in FY92 and addresses all factors that influence a replacement technology, not simply a replacement chemical. The funding profile ($K) (PE63721N) is: FY92 200, FY93 2220, FY94 3550, FY95 2370, FY96 1800, FY97 650, FY98 200.

The Halon 1301 program includes R&D with the other services in addition to Navy specific efforts, minimization of actual use, inventory management, recycling and reclamation. Alternative technologies include inert gas generation and fine water mist spray, neither involving chemicals like Halon.

Halon 1211 (not 1202) handheld extinguishers in aircraft will not be replaced until the USAF program to identify and approve a replacement has succeeded.

Halon 1211 in landing ships will be replaced when the technology has been identified and approved.

Fine Mist Spray technologies for ship engine rooms are in the process of evaluation at the Ex-USS SHADWELL in Mobile, AL. The same technology is being evaluated for aircraft engine and dry bay applications.

The cryogenically cooled suit is an Air Force and NASA joint effort.

Polymer Foaming Agents are being developed at the USAF Wright-Patterson Laboratories, with funding lines covering the FYDP.

Laser Based Systems for detecting colorless flames are also a Wright-Patterson program, with funding lines covering the FYDP.

Cryogenically Cooled Suit

Mr. Weldon. How long is the new cryogenically cooled suit designed to be able to withstand 3000 degrees F?

Mr. HEALING. The suit is a joint effort between NASA and the Air Force, and I defer to the Air Force representative to answer this question.

RAPIDLY TRANSITIONED S&S TECHNOLOGIES

Mr. WELDON. Would you please provide examples of safety and survivability technologies that have been rapidly transitioned into fielded systems?

Mr. HEALING. New systems for safety and survivability have been rapidly introduced and fielded through both the Systems Command and the Safety and Survivability NDI program. Examples of S&S NDIs include the "RAMFAN", a water driven blower that requires no electrical connection, is safe to use in explosive atmospheres, and outperforms the much heavier traditional electrical blower by a factor of more than 5. In less than 24 months, the "RAMFAN" was put through fleet testing aboard designated "assessment ships", bought using a commercial item description and delivered to the fleet, where it is now a part of every damage control locker. NAVAIR took a previously developed and tested design for aircraft collision warning through an NDI streamlined procurement process, reducing the "normal" procurement time from 60 months to only 18 months. The Naval Aircraft Collision Warning System (NACWS) has been responsible for avoidance of probable collisions on at least 3 occasions since it was introduced, along with significant reductions in the number of near mid-air collisions (NMACs) reported. NAVSEA bought and delivered 15,000 units of the Supplemental Emergency Escape Device (SEED) to every ship in 22 months, reducing the time from start of the program to fleet introduction by a factor greater than three. There are other examples; and the Navy Department is committed to continuing the effort to take advantage of NDI strategies where they are applicable.

DOD TELEMEDICINE PROGRAM

Mr. WELDON. Could you describe the DoD telemedicine program and indicate whether the emphasis is on R&D or whether DoD is leveraging commercial technologies for military use?

Dr. JONES. The purpose of military telemedicine is to enhance combat casualty and/or patient care. Through telemedicine, expert medical advice, examination, diagnosis, intervention, management and the monitoring of casualties and patients will be available, on demand, regardless of location. To achieve this, telemedicine embodies the application of commercial-off-the shelf (COTS) medical and communications technologies integrated with advanced technology insertions to provide a system of remote combat casualty and garrison medical care.

A readiness goal is to field high mobile, flexible fighting forces that operate in a Joint and multinational battle environment. The development of a functional telemedicine system that is capable of serving such a force must be based on emerging digital technologies in healthcare and telecommunications. To meet this need, the Department's Advanced Research Projects Agency (ARPA) has a concerted program in healthcare technologies focused on developing advanced devices and software for combat casualty care. In October 1993, the Army Surgeon General formed a partnership with the Director of ARPA establishing the framework for a pioneering effort to provide dynamic healthcare. In June 1995, the DoD formed a Telemedicine Testbed Board of Directors composed of the three Surgeons General of the Services, the Assistant Secretary of Defense for Command, Control, Communication and Intelligence, the Director, Defense Research and Engineering, the Director of ARPA, and the Assistant Secretary of Defense for Health Affairs. The Surgeon General of the Army was designated as the DoD Executive lead-agent for telemedicine.

A principal technology focus of the ARPA program is instantaneous knowledge of and advanced diagnosis of casualties on the battlefield. Dismounted combatants will be equipped with a personal status monitor (PSM) system. The PSM will enable tactical commanders to know precisely where combatants are located, and, if casualties occur, the location of the wounded will be pinpointed allowing rapid combat medic response. The life support design of the PSM will incorporate physiologic vital sign monitoring, with data transmitted rearward to medical personnel. Enroute triage of the casualties within a geographic area will be possible via remote telemedicine networking within the battlefield. Soldiers with the most critical wounds will be reached first. Critical care can then extend onto the battlefield to a greater degree than currently possible.

The second focus area of the ARPA program is medical and surgical intervention. Telemonitoring is the process of "looking over the shoulder" by an experienced surgical or medical specialist connected by remote telecommunications from a CONUS medical center to a surgeon in the mobile surgical environment or to a combat medic. Lending his or her knowledge and experience via two-way audio and real-

time, three dimensional video, the specialist can offer advice, and make real-time recommendations. Telepresence surgery extends to the specialist the capability of actual participation in the surgical repair or stabilization, via robotics instrumentation. Telepresence surgery in an exploratory concept in early prototypic design, and will be looked at more carefully to access its full potential.

The Service strategy is to exploit ARPA and civil telemedical technology and expertise through partnerships with health service organizations, academic institutions, and industry. The objectives of DoD telemedicine include the integration of commercial-off-the-shelf (COTS) technologies, when applicable, for the enhancement of combat casualty care and peacetime military telemedicine utilizing existing state of the art technology.

Use of Animals in Research

Mr. Weldon. As you are well aware, there is great concern about the continued use of animals in DoD research. What can you say about the need for this kind of research? And what is being done by DoD to promote alternative methods that replace, reduce, and refine the use of animals in research activities?

Dr. Jones. The continued use of animals in research, education, and training is absolutely essential to ensure both the health and the sustained technological superiority of our operational forces. The animal use programs of the Department of Defense (DoD) ultimately maintain and improve military readiness by reducing the morbidity and mortality associated with military operations. Additionally, humanitarian benefits of the DoD investment in animal research are shared on an international basis to improve the quality of life of both humans and animals.

Our Service members' health and safety are at risk from combat trauma, infectious diseases, chemical and biological warfare, environmental extremes, and exposure to the dangers inherent in weapons systems. The recent outbreaks of the ebola virus in Zaire; the emergence of drug-resistant malaria throughout the tropics; and the use of nerve gas by terrorists in Japan emphatically reinforce the Department's requirement to sustain a viable and robust program to develop vaccines, novel chemotherapeutic agents and effective antidotes.

We have an ethical obligation to provide the best protection and medical care possible to our men and women in uniform. Consequently, research involving animals is sometimes required. Although many alternatives to animal use have been discovered and applied by the Department, they cannot yet serve as a substitute for animals in all cases. It is the policy of the Department of Defense that alternative methods to animal species be utilized if such alternatives produce scientifically satisfactory results. We have been proactive in implementing initiatives that replace, reduce and refine the use of animals. Since 1987, there has been a forty percent reduction of intramural animal use in our research programs. In addition, the Department has established a variety of initiatives and targeted programs to promote alternative methods. These programs are designed to target individual and institutional awareness by providing educational opportunities, professional training, and monetary resources.

Our review of current animal research reveals that scientists in the DoD have developed or adopted many alternative methods based on ethical considerations and other inherent benefits. One DoD organization, the U.S. Army Medical Research and Materiel Command, has established a major objective to develop replacement, reduction and refinement strategies for the use of animals in research. In FY94 alone, approximately two million dollars was invested in this objective. In addition, the Department sponsors a five-year grant with the Institute of Laboratory Animal Resources of the National Research Council to develop institutional training materials, education, and publications in support of DoD laboratory animal care and use programs. The Department's annual report to Congress, Department of Defense Animal Care and Use programs 1994, cites over 130 specific examples of DoD efforts to replace, reduce and refine the use of animals in research.

Chemical and Biological Defense Equipment

Mr. Weldon. Can you provide the subcommittee an idea of DoD progress in developing more operationally effective and suitable chemical and biological sensors and protective clothing? Please detail the FYDP investment program for these purposes. What mechanism exists for the DoD to share this technology with FEMA, and other federal, state and local governments who would seek a similar emergency services capability?

Dr. Jones. Pursuant to Public Law 103–160 (National Defense Authorization Act for Fiscal Year 1994), Section 1703, the Department of Defense assigned overall coordination and integration of the chemical and biological (CB) defense program to

a single office within the Office of the Secretary of Defense. The Secretary of Defense has assigned overall management to the Assistant to the Secretary of Defense (Atomic Energy). This integration was intended to ensure close and continuous coordination between the CB (non-medical) defense and the CB medical programs to ensure the funding of high priority programs and reduce redundancies. The Secretary of the Army is the executive agent for the DoD CB defense program. The executive agent coordinates and integrates research, development, test, evaluation, and acquisition requirements of the military departments; and reviews funding.

The purpose of the CB defense program is to ensure that U.S. forces are prepared to fight effectively in an nuclear, biological and chemical (NBC) environment. The proliferation of Weapons of Mass Destruction (WMD)—including NBC weapons—around the world, and the likelihood that U.S. forces will be called upon to deploy to any number of areas to counter threats world-wide, poses unique challenges.

Major components of program: The NBC Defense program consists of *medical* and *non-medical* components. While program management for these two components is separate, there is considerable coordination between the two management structures.

Commodity areas: The program consists of five commodity areas that, when taken together, constitute an integrated NBC Defense program. The areas are:

1. *Contamination Avoidance.* This area includes detection, identification, reconnaissance, and warning/reporting systems for nuclear contamination and chemical and biological agents.
2. *Individual Protection.* This area includes individual respiratory (masks) and whole body protection (protective clothing).
3. *Collective Protection.* This area includes equipment for the collective protection of forces other than medical units. Specific collective protection equipment for use by medical units and personnel is included under the medical commodity area.
4. *Decontamination.* This area includes personnel and equipment decontamination systems and decontaminants.
5. *Medical.* This area includes chemical and biological pre-treatments, vaccines and prophylaxes, therapeutics, field diagnostics, skin decontaminants, patient management systems and medical unique systems.

FUTURE PLANS

The science and technology program is transitioning towards an emphasis on joint, high priority needs. Major investments are planned in contamination avoidance technology, especially biological point detection and chemical and biological stand-off detection. An Advanced Technology Demonstration—*Integrated Biodetection*—planned for FY 1996–1999, will include prototype point and stand-off detectors for all Services.

PROGRAM HIGHLIGHTS

Contamination Avoidance. Contamination avoidance represents our primary and highest priority goal in NBC Defense. OSD Program Strategy Guidance identified the fielding of a theater-level biological detection system as the highest priority. The current strategy includes the FY 96 activation of a ground-based biological agent point detector and a rapid-prototype point detector for shipboard applications. Future improvements will be accomplished under the Joint Service Biological Point Detection project. The current strategy also provides for a long-range stand-off biological detector to begin fielding in FY 98 and for a short-range stand-off biological detection and confirmation system to begin production in FY 02.

In the area of chemical detection and reconnaissance, improvements are ongoing and are included in the NBC Reconnaissance Systems (NBCRS) Block 1 Modification scheduled for fielding in FY 98. Efforts are under way to develop and field improved point detectors, including the fielding of a ship-mounted automatic liquid agent detector by FY 99. The far-term goals are to field, for Joint Service applications, highly sensitive, multi-agent, liquid/vapor point and stand-off detectors, and aerial based systems which provide real time battlefield detection.

Individual Protection. In the individual protection area, our strategy focuses on both a joint service lightweight protective ensemble, with fieldings scheduled for FY 97; and improved aircrew respiratory protection systems for all Services. The far-term emphasis is on integrated respiratory components.

INVESTMENT SUMMARY

[In millions of dollars]

	Fiscal years	
	1996	1997
Improved detectors/sensors:		
Technology base	33 03	34 52
Dem VAL/& EMD	81 14	106.18
Procurement	97.34	121 16
Protective Equipment:		
Technology base	4 58	5.16
Dem VAL/& EMD	17 47	11 55
Procurement	28.50	49.65

A comprehensive overview of the DoD CB defense program, the Annual Report to Congress on NBC Warfare Defense, was submitted to Congress in April 1995.

Laser Eye Protection

Mr. Weldon. Can you give us some idea of the threat posed by lasers to aircrews and ground personnel, what protective equipment DoD has fielded and the extent of fielding, and the research and development being performed to address that issue?

Dr. Jones. Currently, aircrews and ground personnel are vulnerable to laser exposure from laser rangefinders (LRFs), laser target designators (LTDs), and electro-optic counter measure systems. They represent the hazards from our own equipment as well as foreign devices. These lasers can cause visual disruption and eye damage at ranges in excess of 10 kilometers. Most lasers emit light at a specific wavelength. However, frequency-agile lasers which emit light at various wavelengths complicate the countermeasures issue.

To counter this threat, protection from fixed-line (single wavelength) lasers is provided by using absorptive dyes molded into goggle lenses and helmet visors. These devices provide protection against either two or three of the most common wavelengths used. Three wavelength protection is only usable during the daytime due to low light transmission. The Army procured dyed lenses for Operation Desert Storm and has recently type classified this technology for the Sun, Wind, and Dust (SWD) Goggle, Ballistic/Laser Protective Spectacle (B/LPS), and the Special Protective Eyewear Cylindrical System (SPECS). The Air Force has incorporated dye based three wavelength protection (Barnes Visors) into their helmet visors, and deployed this technology in the late 80's.

Currently, research and development in this area can be divided into two thrusts: (1) fixed-line laser protection with increased tansmission to allow three-line (and more) protection at night; and (2) wavelength independent laser protection. The fixed-line protection being developed uses materials that reflect light at specific wavelengths. The efforts to provide protection from lasers operating at unknown wavelengths have taken several approaches. The first approach is to use an optical power limiter which is activated when irradiated with laser energy, and prevent the laser from damaging the eye. Another approach is to use a tunable filter (typically based on liquid crystals or non-linear photorefractive materials). Lastly, statistical reflection filters can be used to reflect most of the visible light while allowing only select portions of the visible spectrum to pass through. This statistical approach makes it hard for the opponent to know which portion of the spectrum to use.

Personnel Status Monitor Program

Mr. Weldon. Can you describe the personnel status monitor program objectives, level effort, and how the program is being managed?

Dr. Jones. The Advanced Research Projects Agency (ARPA), in partnership with the Service medical departments, is developing a new and innovative capability for the combat casualty care of the wounded soldier: the Personnel Status Monitor System (PSM). The PSM is a triad of devices consisting of soldier unit to be body-worn by dismounted combatants. The soldier PSM unit will noninvasively monitor selected physiologic vital signs, transmit data to command PSM unit, and then communicate remotely to a PSM combat medic unit. The PSM system will incorporate cellular communications and Gobal Positioning System (GPS). These technologies give the unit the capability to identify a combat casualty, pinpoint the casualty's location, and transmit key vital signs data to medical personnel. Combat medics will

receive the transmitted physiologic data, and in multiple casualty situations be able to triage the wounded enroute to the soldiers' location.

The PSM contract, awarded to SARCOS Research Corporation in August 1994, is funded by ARPA and the US Army Medical Research and Material Command at approximately $3 million per year over a 5 year period. The Departments of Justice and Health and Human Services are assessing the PSM's efficacy for civilian applications.

Redirected by ARPA in April of 1995, the PSM program was tasked to support the definition and development of a Ranger Overwatch Personnel Status Monitor (ROPSM) system. The focus of the ROPSM development is to: (1) mitigate further hypothermic condition situations during training and; (2) develop a continuous R&D testbed for the prototyping of the PSM system and other ARPA medical program devices. The ROPSM will detect, warn and locate a casualty at the onset of hypothermia.

In liaison with the US Army TRADOC Infantry Training Center and the Dismounted Battlespace Battle Lab at Fort Benning, Georgia, the Ranger School will exercise and evaluate the PSM system to assess its potential for the Army at large. This level of cooperation will ensure that user feedback occurs throughout the R&D phases of the PSM program.

H–60 Helicopter Crashworthy Passenger Seats

Mr. Weldon. It is reported that all service models of the H–60 helicopter have crashworthy passenger seats. Is this correct?

Dr. Hicks. Yes. The passenger seats in H–60 helicopters are "crashworthy" as compared to seats in predecessor helicopters. The level of protection provided by the passenger seats is less than that provided by the crew seats, because of configuration and weight constraints. Though not as fully "crashworthy" as the crew seats, the passenger seats do demonstrate significant improvement in injury prevention over earlier passenger seats because of the improved occupant retention and crash force attenuation design. All services use the same H–60 passenger seats and thus have the same degree of protection for occupants.

Mr. Weldon. It is also reported that each service has different armor configurations for the crew seats. Is this true? If so, can you describe the process and requirements differences that would require different configurations for each service?

Dr. Hicks. All H–60 helicopters have airframe-mounted armor panels for crew protection. In addition, crew seats on Army and Air Force H–60's include armor panels, while Navy H–60 crew seats do not. It is the Army's understanding that Navy H–60 helicopters do not use the additional seat-mounted armor because it was determined that the airframe-mounted armor was sufficient for the mission demand.

Crashworthy Fuel Systems and Troop Seats

Mr. Weldon. In his prepared statement, Dr. Hicks indicated the dramatic improvement in preventing casualties due to postcrash fires through the use of crashworthy fuel systems for its helicopters.

What percent of all Navy, Air Force and USMC helicopters have been modified to meet this standard?

Dr. Hicks. It is reported that all service models of the H–60 helicopter have crashworthy passenger seats. Is this correct?

It is also reported that each service has different armor configurations for the crew seats. Is this true? If so, can you describe the process and requirements differences that would require different configurations for each service?

Mr. Healing. What percent of the Navy and USMC helicopter fleet, other than the H–60 variants, have crashworthy seats similar in capability to the H–60, e.g. the CH–53?

Mr. Healing. Where applicable and affordable, crashworthy fuel systems have been incorporated into both Navy and Marine Corps helicopters. According to NAVAIR, approximately 90 percent of the combined helicopter fleet is covered with at least partial crashworthy fuel systems. For Naval applications, these systems take on greater significance because they protect not only the people are doubly critical, protecting not only the people aboard a helicopter in the event of a mishap, but also the ships from which we operate and the crews aboard them. The only helicopters not having crashworthy fuel systems are those where extensive and expensive modifications would be required on older airframes with very limited useful life remaining. It is not economically feasible to retrofit all components of a crashworthy fuel system into the existing fleet of helicopters.

With respect to H–60 crashworthy passenger seating, all H–60 Naval variants have crashworthy crew seating for designated crewmembers with mission related

inflight responsibilities. None of our troop carrying helicopters have crashworthy passenger seats. In addition to the H–60, crashworthy crew seating is incorporated in the following aircraft; H–46E, H–3, CH–53D, CH–53E (after Lot 10), MH–53E and V–22. The following aircraft do not have crashworthy crew seating: AH–1, UH–1, TH–57 and H–46D. There are a few exceptions, and the CH–53E (Lot 10 and earlier) without crashworthy crew seating have a funded retrofit program. Additionally, there is a commitment to ensure a common crashworthy seat for troop carrying applications.

Armor configurations are generally remained common across the services when applied to the same aircraft type, model, series. Some Navy missions do not require seat armor, while most Marine Corp missions do require the protection against ground fire. The armored seats are similar throughout the services that use variants of the H–1, H–53, H–60 and V–22, except the UH–1N, which was reengineered for improved crash survivability, including seat design and armor configuration, with the conversion to two engines.

Funding for Safety and Survivability Projects

Mr. Weldon. What safety and survivability projects would you start or fund more fully if additional funding were available?

Dr. Jones. (1) Obstacle/wire avoidance system. (2) Forward looking radar altimeter. (3) Human performance error hazard management technologies. (4) Flight Data Recorders. (5) Crashworthy external fuel tanks.

Next Safety and Survivability Projects

Mr. Weldon. What safety and survivability projects would you start or fund more fully if additional funding were available?

Mr. Healing. Based on our analysis of experienced losses and trends, much of my emphasis would be on improvements in aviation. First, I would aim at projects that could provide the ability to totally avoid the loss; i.e. traffic alert and collision avoidance system (TCAS); and I would closely analyze mitigation potentials in the event of a mishap; i.e. crashworthy seating. Initially, I would seek to start vigorously into integration of NDI/COTS technologies related to Condition Based Maintenance (CBM), which have the ability to predict failures far in advance of reaching catastrophic proportions. The maintenance cost reduction potential alone is so great that these programs should be at the top of everyone's list because of payback under an investment strategy.

In conjunction with that, I would seek full funding and mandated early installation of crash survivable and/or deployable flight data and voice recording capability in all military aircraft, to cover every flight from takeoff to landing. Recovered data, voice communication and cockpit noises are the real window to human performance in multi-million dollar aircraft; while 75%–80% of aircraft mishaps are primarily tied to human performance failure in one way or another. Objective data recovered through such NDI/COTS equipment will give direction and meaning to efforts that will be effective in correcting this largest family of causal factors. As the airline industry long ago discovered, resolution of mishaps is infinitely easier with full data recovery, and they are now seeking state-of-the-art upgrades. We should lead, not follow on this.

I would like to see full funding as soon as possible of the Ground Proximity Warning Systems (GPWS) for all aircraft. This is another high payback system, based on the number of Controlled Flight Into Terrain (CFIT) incidents. All services share these losses, and the need for wider implementation of effective systems to avoid them. Historically, the airline industry achieved over 90 reduction in CFIT mishaps following introduction of GPWS in the mid-1970s. While our mission profiles are significantly different from airline flying, there are strong indications that we would achieve early and significant paybacks through mishap avoidance.

At appropriate times and upon your request, I will be pleased to supplement this initial listing of S&S programs requiring more emphasis.

List of Service Mishap Data Available for Fiscal Years 1990–1995

Mr. Weldon. Please provide all service mishap data available for the period FY 90–94 and the first half of FY95.

Dr. Jones. Data provided under separate cover. Included is statistical summaries for both Army aviation and ground accidents for the periods October 1979 to present and October 1989 to present, respectively. These periods were selected and provided because criteria for reporting aviation and ground accidents respectively have remained fixed over those time periods. Also included are more detailed narratives on

each Army aviation accident during the period October 1989 through March 1995, for more in-depth review as required.

2 AUGUST 1995.

Memo for Record.
Subject: Army Fire Accident Experience.

Enclosure 1 summarizes Army ground accident experience involving fires, for the last five years. Experience is summarized for helicopters both with and without crashworthy fuel systems. Abbreviations used are as follows:

AMV includes Army Motor Vehicles
AOV includes Army Operated Vehicles (ie, Army owned versions of commercial vehicles)
CBTVEH includes Combat Vehicles
OAV includes Other Army Vehicles
M–FT is total number of military fatalities
M–NF is total number of military nonfatal injuries
C–FT is total number of civilian fatalities
C–NF is total number of civilian nonfatal injuries
DMG-COST is total hardware damage cost
INJCOST is total personnel injury cost

JAMES E. HICKS, Ph.D.,
Director, Information & Systems Technology.

FY90–31 JUL95 ARMY—CLASS A, B, C FIRE ACDTS INVOLVING SYSTEMS—THIS MATRIX IS FOR THE FOLLOWING GROUP 90

	A	B	C	D	TOT	M-FT	M-NF	C-FT	C-NF	DMG-COST	INJCOST	TOT-COST
AMV	0	0	8	0	8	0	1	0	0	261381	120	261501
AOV	0	1	0	0	1	0	1	0	0	8500	115000	123500
CBTVEH	1	0	6	0	7	1	1	0	0	682764	126950	809714
Fire	1	0	12	0	13	1	2	0	1	605279	164846	770125
OAV	0	0	1	0	1	0	0	0	0	128155	0	128155
Other	0	0	0	0	0	0	0	0	0	0	0	0
Total	2	1	27	0	30	2	5	0	1	1686079	406916	2092995
Count of accidents												30

FY90–31 JUL95 ARMY—CLASS A, B, C FIRE ACDTS INVOLVING SYSTEMS—THIS MATRIX IS FOR THE FOLLOWING GROUP 91

	A	B	C	D	TOT	M-FT	M-NF	C-FT	C-NF	DMG-COST	INJCOST	TOT-COST
AMV	4	1	16	0	21	2	8	0	0	264815	385114	3026929
AOV	0	0	2	0	2	0	0	0	0	20530	0	20530
CBTVEH	1	12	8	0	21	0	1	0	0	7640801	990	7641791
Fire	2	1	10	0	13	0	52	0	3	42696499	354015	43050514
Other	0	0	0	0	0	0	0	0	0	0	0	0
Total	7	14	36	0	57	2	61	0	3	52999645	740119	53739764
Count of accidents												57

FY90–31 JUL95 ARMY—CLASS A, B, C FIRE ACDTS INVOLVING SYSTEMS—THIS MATRIX IS FOR THE FOLLOWING GROUP 92

	A	B	C	D	TOT	M-FT	M-NF	C-FT	C-NF	DMG-COST	INJCOST	TOT-COST
AMV	0	1	4	0	5	0	0	0	0	551112	0	551112
CBTVEH	1	1	4	0	6	1	2	0	0	1123643	130238	1253881
Fire	0	0	7	0	7	0	2	0	1	226078	7949	234027
Other	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	2	15	0	18	1	4	0	1	1900833	138187	2039020

FY90–31 JUL95 ARMY—CLASS A, B, C FIRE ACDTS INVOLVING SYSTEMS—THIS MATRIX IS FOR THE FOLLOWING GROUP 92—Continued

	A	B	C	D	TOT	M-FT	M-NF	C-FT	C-NF	DMG-COST	INJCOST	TOT-COST
Count of accidents												18

FY90–31 JUL95 ARMY—CLASS A, B, C FIRE ACDTS INVOLVING SYSTEMS—THIS MATRIX IS FOR THE FOLLOWING GROUP 93

	A	B	C	D	TOT	M-FT	M-NF	C-FT	C-NF	DMG-COST	INJCOST	TOT-COST
AMV	0	0	5	0	5	0	2	0	0	233709	1680	235389
AOV	1	0	0	0	1	1	0	0	0	12846	125000	137846
CBTVEH	0	0	2	0	2	0	3	0	0	18500	58106	76606
EXPLOS	0	0	1	0	1	0	0	0	0	45000	0	45000
Fire	0	2	7	0	9	0	2	0	0	1192172	2820	1194992
Other	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	2	15	0	18	1	7	0	0	1502227	187606	1689833
Count of accidents												18

FY90–31 JUL95 ARMY—CLASS A, B, C FIRE ACDTS INVOLVING SYSTEMS—THIS MATRIX IS FOR THE FOLLOWING GROUP 94

	A	B	C	D	TOT	M-FT	M-NF	C-FT	C-NF	DMG-COST	INJCOST	TOT-COST
AMV	0	0	1	0	1	0	0	0	0	13100	0	13100
CBTVEH	0	1	3	0	4	0	0	0	0	414736	0	414736
Fire	0	1	6	0	7	0	3	0	0	1134875	2205	1137080
Other	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	2	10	0	12	0	3	0	0	1562711	2205	1564916
Count of accidents												12

FY90–31 JUL95 ARMY—CLASS A, B, C FIRE ACDTS INVOLVING SYSTEMS—THIS MATRIX IS FOR THE FOLLOWING GROUP 95

	A	B	C	D	TOT	M-FT	M-NF	C-FT	C-NF	DMG-COST	INJCOST	TOT-COST
AMV	1	0	1	0	2	1	0	0	0	17800	125000	142800
CBTVEH	0	1	2	0	3	0	0	0	0	1164622	0	1164622
Other	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	1	3	0	5	1	0	0	0	1182422	125000	1307422
Count of accidents												5

Service Mishap Data

Mr. Weldon. Please provide all service mishap data available for the period FY 90–94 and the first half of FY 95

Mr. Healing. This has been provided separately to the staff.

Safety and Survivability Requirements

Question. How does DoD and the military services identify operational and potential combat personnel safety and survivability requirements? How do you prioritize these requirements?

Answer. The Air Force develops requirements to fulfill deficiencies identified by Mission Area Analysis, Mission Need Analysis, Material Deficiency Reports, and mishap and incident board recommendations. Deficiencies are gaps in the Air Force's ability to conduct the mission.

Deficiencies can be solved in one of three ways: low cost modifications to existing systems, major modifications to existing systems, and new system acquisitions.

Equipment deficiencies identified by the operations and maintenance personnel are documented in the Air Force's Material Deficiency Report. Material Deficiency Reports may generate operations or maintenance procedural changes, revisions to technical data, test or inspections of equipment, or generate development of a maintenance action or modification to correct the safety/survivability deficiency. Each report is assessed to determine whether delaying the solution will endanger the safety of personnel or cause loss or extensive damage to systems or equipment. If the MAJCOM Commander determines that this is the case, it is identified as a Safety Modification, moved to the top of the priority list, funded, and corrected.

Deficiencies that require a major modification to an existing system or new acquisition to correct, lead to the development of an Operational Requirements Document (ORD). Safety and survivability requirements are documented in ORDs in two ways:

a. Requirements for new acquisitions, not directly related to safety or survivability deficiencies, will be written such that they not only correct the mission performance deficiencies, but also any known safety or survivability problems.

b. The second way is via an ORD for a major modification to an existing system or new acquisition that directly corrects a mission deficiency relating to safety or survivability.

Commercial Equipment

Question. We get various reports that the services do not take sufficient advantage of off the shelf, commercially available equipment or do not look to the other Services or Executive Departments first for solutions to their requirements. The statements prepared for the record indicate significant use of off the shelf, commercially available equipment. The question is, is there a formal process that requires the Service Departments to consider already developed equipment and are we taking as much advantage of commercially available equipment as we could?

Answer. Title 10, United States Code, Section 2325. "Preference for Nondevelopmental Items," and Part 6, Section L, "Nondevelopmental Items," of DoD Instruction 5000.2, "Defense Acquisition Management Policies and Procedures," require the Service Departments to use Nondevelopmental Items (NDI) to the maximum extent possible to satisfy the user's needs. These solutions must be cost effective over the products entire life cycle. NDI includes any item that is available on the commercial marketplace or any previously developed item in use by a Federal, State, or local agency of the US government.

In addition, Air Force Instruction 10–601, Mission Needs and Operational Requirements Guidance and Procedures, directs, when assessing materiel solutions, operating major commands will follow the DoD order of preference:

Use or modification of an existing US military system.

Use or modification of an existing commercially developed or allied system, fostering an NDI acquisition strategy.

A cooperative R&D program with one or more Allied Nations.

A new Joint-Service development program.

A new Service-unique development program.

The Air Force makes every effort to take full advantage of commercially available items.

Focal Points

Question. While the hearing testimony indicated that the Army and Air Force have focal points for safety and survivability in their respective secretariats similar to the Navy, these focal points were unknown to the services legislative affairs offices when the hearing was being arranged. Please identify these focal points by name and position for the record.

Answer. Safety

SAF/MIQ—Deputy Assistant Secretary (Environment, Safety, & Occupational Health)

Principal: Mr. Thomas W.L. McCall (703) 697–9297

HQ USAF/SE—Chief of Safety

Chief: Brig Gen Orin L Godsey (703) 693–7280

We could not find any office that is the focal point for survivability on the Secretariat Staff.

Safety for Firefighting Personnel

Question. In your opinion, is all of the equipment and clothing in use adequate to meet operational requirements and provide reasonably adequate levels of safety for fire fighting personnel? Where are the deficiencies? Are the corrective actions for these deficiencies adequately funded?

Answer. Yes, all equipment and clothing in use by the Air Force fire fighters meets operational requirements and provides adequate levels of safety for fire fighting operations. Air Force policy requires that all equipment and clothing purchased meet both National Consensus Standards and the National Fire Protection Association Standards. The Air Force does have approximately 250 structural fire fighting vehicles which do not have the recently required fully enclosed cab. These vehicles will be replaced as they meet their life expectancy of approximately 12 years.

Compression Burns

Question. The firesuits worn by our nation's civilian firefighters have demonstrated shortcomings in thermal protection when the inside thermal insulation becomes wet and compressed. In such cases, even though the outside of the garment is not damaged, the wearer becomes susceptible to a phenomenon known as "compression burns." Recently the City of Philadelphia won a lawsuit against a major firesuit manufacturer for not properly cautioning the wearers about this condition. Do firesuits provided to our government civilian and military firefighters adequately protect personnel against "compression burns" and, if not, what steps are being taken by DoD to improve this shortcoming?

Answer. The Air Force does not have a problem with compression burns or with scalding due to excessive moisture being trapped in the insulation. The problem is prevented through the use of fire suits with additional protection at potential compression points and with a vapor permeable/moisture impermeable layer integrated with the insulation (this feature allows perspiration to escape while preventing water intrusion into the insulation). This level of protection exceeds the minimum NFPA 1971 standards. To preclude firefighter compression type injuries, the Navy Clothing and Textile Research Facility (NATICK) recommends specifying the above features when purchasing commercial suits. Post industrial fire investigations have shown numerous firefighters receive compression type burns due to the suit being too tight a fit. Fire suits should be procured to fit the individual firefighter, not on a "one size fits all" basis.

Fire Extinguishers

Question. Are there substitutes for Halon 1301 and 1202, used in portable fire extinguishers? Are there plans to replace these extinguishers?

Answer. Halon 1301 and 1202 are not used in portable fire extinguishers. Halon 1211 is the chemical used in portable fire extinguishers and 150lb flightline bottles. Halon 1301 is currently used in engine nacelles and aircraft dry bays for fire suppression. Halon 1202 is used for thrust/vector control on Minuteman II ICBMs.

There are substitutes for halons used in portable extinguishers depending on the application. The Air Force has an ongoing phase out program to replace facility hand held Halon 1211 portables with water and dry chemical extinguishers. To date, 89,500 units have been replaced; the remaining 33,000 units will be phased out over the next several years. Halon 1211 releases have been reduced by 85%. Air Force Halon 1211 aircraft portable and 150lb flightline extinguishers are continuing to be used pending Wright Laboratory development of a Halon 1211 equivalent agent. Several alternatives have been proposed and tested. While EPA has approved these replacements, the tests have shown some of the agents to be not as effective as Halon 1211 and others are scheduled to be phased out, have use restrictions, or have a higher than desired cardio sensitivity levels. The Air Force has adequate Halon 1211 stocks, approximately 4 million pounds, in the Defense Logistics Agency Halon Bank and base level supply to support mission requirements while it pursues a more benign and permanent solution.

Duplicative Testing

Question. There appears to be several testing activities duplicating testing of the same technologies, e.g., fire mist and Halon alternatives. Is this the case? If so, shouldn't the Reliance process preclude this?

Answer. There is no duplicate testing of fire fighting technologies. In accordance with Project Reliance, responsibilities for testing are assigned based on specific applications of the technologies. For example, Wright Laboratory is lead DoD agent

for aircraft crash rescue and facility fire fighting research. The Naval Research Laboratory is testing various alternatives for suppressing fuel fires in ship machinery spaces.

PROJECT FUNDING

Question. How much funding by year (FY95 and prior, and FYDP period), program element and organization has been programmed to the following projects and what are the originally planned and current time frames in which these technologies will be available?

Halon 1301 to substitute as a total flood agent.
Halon 1202 to handheld extinguishers in aircraft.
Halon 1202 in portable units on landing ships.
Fine mist spray systems in engine rooms of ships.
The cryogenically cooled firefighter ensembles.
Polymer foaming agents.
Laser based systems for detecting colorless flames.

Answer. The following reflects the Air Force plans and investment in these technologies:

Halon 1301 for Air Force command and control facilities:
Organization: Air Force Wright Laboratory
Availability: Original-Dec 95, Current-Dec 95

Funding ($K)	Prior	Fiscal year 95	Fiscal years 96-00
PE 62206F	420	0	0
PE 63723F	375	350	0

Halon 1301 for in-flight fire suppression for engine nacelles
Organization: Air Force Wright Laboratory
Availability: Original-Dec 95, Current-Dec 95

Funding ($K)	Prior	Fiscal year 95	Fiscal years 96-00
PE 63106F	6165	1781	0
PE 63721N	2550	1540	0
PE 65801A	2040	1100	0
Other	3305	125	0

Halon 1211 (vs 1202 as referenced in the question) is used for aircraft/flightline handheld fire extinguishers.
Organization: Air Force Wright Laboratory
Availability: Original-Dec 98, Current-Dec 98

Funding ($K)	Prior	Fiscal year 95	Fiscal years 96-00
3400 Funds	600	0	0
PE 62206F	0	200	0
PE 62201F	0	0	100
PE 63205F	0	0	594
SERDP	850	383	1350

Cryogenically Cooled Firefighter Ensemble
Organization: Air Force Wright Laboratory
Availability: Original-Jan 96, Current-Jan 96

Funding ($K)	Prior	Fiscal year 95	Fiscal years 96-00
PE 62206F	324		
PE 63723F	516	256	
PE 63205F	0	0	50

Polymer Foaming Agents
Organization: Air Force Wright Laboratory
Availability: Original-Dec 98, Current-Dec 98

Funding ($K)	Prior	Fiscal year 95	Fiscal years 96 00
PE 63205F	0	0	482

Laser Based Detecting Systems
Organization: Air Force Wright Laboratory
Availability: Original-Dec 97, Current-Dec 97

Funding ($K)	Prior	Fiscal year 95	Fiscal years 96 00
PE 63723F	0	150	0
PE 63205F	0	0	350

Aircraft Ejection Seats—Industrial Base

Question. The recent JPATS aircraft selection has a non-U.S. manufactured ejection seat. Because DoD is procuring so few tactical aircraft, the JPATS competition was the only opportunity for any significant U.S. production. It is reported that non-U.S. manufactured seats cost two-to-three times the cost of U.S. made ejection seats. Do you have any concern with regard to the U.S. industrial base for aircraft ejection seats?

Answer. Yes. We are concerned about the U.S. industrial base for aircraft ejection seats. As fewer aircraft are procured, it will become increasingly difficult to sustain U.S. ejection seat technology expertise and production facilities in the future to support either continuous seat improvements for aging aircraft or new aircraft.

Aircraft Ejection Seats—Protection Levels

Question. As the Reliance lead service representative on ejection seats, is it correct to say that DoD policy change, allowing females to fly tactical aircraft, has put the services in a position of not really knowing the level of protection afforded light weight pilots relative to the average male pilot? We understand that in some cases that the occupant of some Navy and AF tactical aircraft are not able to cinch themselves down in the ejection seats because of seat design being incompatible with the size of the occupant. Is it correct to say that with the new Joint Primary Aircrew Training System aircraft, flight school students will be afforded a greater degree of protection in training than when they graduate and fly operational F–18 and F–16 aircraft?

Answer. Yes. The DoD policy change has expanded the range of occupants eligible to fly tactical aircraft and the Air Force has research programs ongoing to determine the level of protection afforded light weight pilots relative to the average male pilot. This research will determine the differences in protection afforded by JPATS flight students and tactical aircraft pilots.

Aircraft Ejection Seats—Statistical

Question. Air Force statistics indicate that 90 percent of ejections are successful. However, we understand that the Air Force doesn't include in its data, ejection statistics for ejections made outside the seats design envelope. In addition, we understand that if the seat occupant survives, regardless of his or her injuries, the ejection is considered "successful." Doesn't this way of tracking ejection seat use ignore the people, resource, and readiness cost impact of the failure of ejection seats to adequately protect personnel?

Answer. The following information is based on the ACES II ejection seat used in most USAF aircraft and accounts for the majority of the ejections. The Air Force Chief of Safety records, tracks, and provides data on all USAF non-combat ejections.

The Air Force has a 91 percent success rate for all ejection attempts in the ACES II ejection seat. That figure taken alone can be misleading. The ejection envelop for the ACES II goes from no airspeed and no altitude Lip to 600 knots with only enough altitude for the system to function. If every crewmember initiated ejection within the envelope, the success rate for the "seat" to remove the crewmember from the aircraft would be much higher than the 91 percent. There are flight regimes that will put the crewmember out-of-the-envelope and these are encountered on most missions. These include; high decent rates at low altitudes, as encountered on some weapons deliveries, evasive maneuvers at low altitude, and inverted flight or high bank angles at low altitude. The majority of unsuccessful ejection attempts and fatalities with no ejection attempt occur in the low altitude regime. The other areas

that could result in fatalities after ejection is attempted include; high speed flailing/internal injuries, collision with the ejection seat or some other object, drowning, dragging, and exposure. The total numbers from these causes are very small.

The successful ejections seldom result in injuries that permanently remove a crewmember from flying duties. The most prevalent injuries are minor and result in few lost workdays. These lost workdays and injuries are recorded by Air Force Safety Agency, HQ USAF/SE's Field Operating Agency.

Any problem with the ejection system is closely watched and aggressively worked. The Air Force Safety Agency, HQ USAF/SE's Field Operating Agency, routinely sends its egress system expert to mishaps to assist mishap boards with their investigation. As problems surface that warrant a change in design, maintenance, or employment these are worked with the appropriate agencies. Some of the areas that cause problems are difficult to pin down such as the effects of ejection during a roll or yawing motion as happens if the aircraft is out-of-control. Fixing these types of problems is very costly and may, in some situations, be outside the capability of the current ejection seat to overcome. Fortunately, the majority of our peacetime ejections resulted in few serious injuries or fatalities because the ejection seat does provide good escape capability.

Aircraft Ejection Seats—Upgrades

Question. The subcommittee has been told that there is a difference of view at the senior levels of the Navy and Air Force whether there should be an investment in upgrading ejection seats in current high performance aircraft so they provide greater protection to the small, lightweight occupant and greater protection for ejections at speeds above 400 knots. The current ejection seats were qualified for use in the late '70's and early '80's. Since then there have been no major upgrades despite evidence that increased seat instability and wind blast at higher speeds continue to cause major injuries and fatalities. Given the Air Force is the lead department on this issue, is what we have been told correct? Are upgrades planned for current Navy and Air Force ejection seats? Please provide the investment profile, by service, for the FYDP for upgrading NACES and ACES II ejection seats.

Answer. The Air Force is committed to support research in improving ejection seats. The Air Force operational commands are monitoring these technologies for possible future upgrades to the ACES II seat. At present, the Air Force has no funded program to upgrade existing ACES II seats.

Commercial Technology

Question. One system that potentially highlights the inadequacy of the Department to use commercially available technology is the case of survival radios. Was the recent negative publicity associated with Captain Scott O'Grady's bad experience with the PRC 112 compared to readily available cellular telephone technology unfair or do we have problem?

Answer. Capt. O'Grady's comments toward PRC–112 were not that the radio failed, but that he experienced some difficulty in its mechanical structure. He chose to utilize the radio in a fashion that would maximize his survival. This has been documented in the hearing on the F–16 shootdown over the former Yugoslavia dated 11 July 1995 with Representative Floyd Spence (R-SC) and General John Shalikashvili, Chairman of the Joint Chiefs of Staff. Yes, it is unfair to compare a commercial cellular telephone with the PRC–112, and this is especially true when a secure voice is needed in a future radio system such as Combat Survivor Evader Locator (CSEL). The PRC–112 has problems and there are plans to replace the radio. However, due to MAJCOM funding priorities, they have been unable to purchase newer radios in previous years. There is a process underway to field 500 new radios going to Navy and Air Force pilots. This is an interim fix. There is also a long range plan within the services to replace all survival radios, and this is now in the planning stage for acquisition. A commercial cellular phone may not survive an ejection, and if it did, it would not survive the rugged and demanding use by the crewmember in adverse conditions.

Crashworthy Equipment

Question. In his prepared statement, Dr. Hicks indicated the dramatic improvement in preventing casualties due to posterash fires through the use of crashworthy fuel systems for its helicopters. What percent of all Air Force helicopters have been modified to meet the standard?

Answer. 100% of the H–1 helicopter's fuel supplies are contained in five crashworthy cells interconnected to act as a single tank. 100% of the H–60 fuel cells are

crashworthy. This includes the internal auxiliary tanks. 72% of the H–53 helicopters have crashworthy fuel cells and crash resistant tanks. The remaining 28% will be modified starting September 1995.

Crashworthy Equipment

Question. It is also reported that each service has different armor configurations for the crew seats. Is this true? If so, can you describe the process and requirements differences that would require different configurations for each service?

Answer. The Air Force does not put armor components into ejection seats. However, the A–10 does have cockpit armor protection, because it was a design requirement to protect pilots during missions with higher combat exposure. C–130s flying special missions in hostile environments utilize armor plating to protect crews, but this is not the normal C–130 configuration. Air Force helicopters such as the MH–53J and the MH/HH–60G are armor protected and utilize the same armored crew seat design as the Army.

Safety and Survivability Projects

Question. What safety and survivability projects would you start or fund more fully if additional funding were available?

Answer. Air Force Life Support funding for engineering, manufacturing, and development (EMD) requirements would first go into the shortfall for FY96 under the night vision system (NVS). This program has taken cuts in the past and has restructured to the point of a shortfall in FY96. The amount needed for NVS is $3.5M in FY96. The following list is an estimate for funding requirements for new starts. The top four in order of preference are ATAGS, ACES II CIP, LEP, and COMBAT ACE.

	Fiscal year					
	1997	1998	1999	2000	2001	2002
ATAGS	.6	.6	2			
ACES II CIP	4.0	6.0	7.0	7.0	7.0	7.0
Laser eye protection		3.0	3.3	3.1	.6	6
COMBAT ACE			6.7	6.9	7.0	1.0
FAMBRC		.3	.9	2		
Low profile parachute		(1)	(1)	(1)		
Equipment evaluation		2.0	2.0	2.0	2.0	2.0
Assured air passage		1.3	1.5	2.9	7	4
Total	4.6	[2] 13.2	[2] 21.8	[2] 22.1	17.3	11.0

[1] TBD.
[2] Affected by LPP funding.

ATAGS (Advanced Technology Anti-Gravity Suit).
ACES II CIP (Advanced Concept Ejection Seat II Continuous Improvement Program).
Laser Eye Protection (LEP).
COMBAT ACE (COMBined Advanced Technology Acceleration/Chemical Ensemble).
LLP (Low Profile Parachute).
FAMBRC (Female Aircrew Member Bladder Relief Control).

Service Mishap Data

Question. Please provide all service mishap data available for the period FY90–94 and the first half of FY95.

Answer.

Fiscal year	Class A	Class A rate	Destroyed aircraft	Fatality	
				Pilot	Others [2]
1990	52	1.49	53	21	44
1991	41	1.11	38	10	18
1992	47	1.65	43	25	53
1993	34	1.35	35	15	42
1994	36	1.51	21	11	28
1995 [1]	22	1.35	21	11	28

[1] First 6 months of FY95 (Oct–June 95) only
[2] Includes all passengers and other fatalities.

Fiscal year	Offduty mishaps	Fatals	Onduty mishaps	Fatals	Total mishaps	Fatals
1990	117	111	26	14	143	125
1991	97	93	25	16	122	109
1992	80	72	14	9	94	81
1993	82	72	22	16	104	88
1994	81	78	19	21	100	99
1995 [1]	39	35	3	1	42	36

[1] First 6 months of FY95 (Oct Jun 95) only.

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